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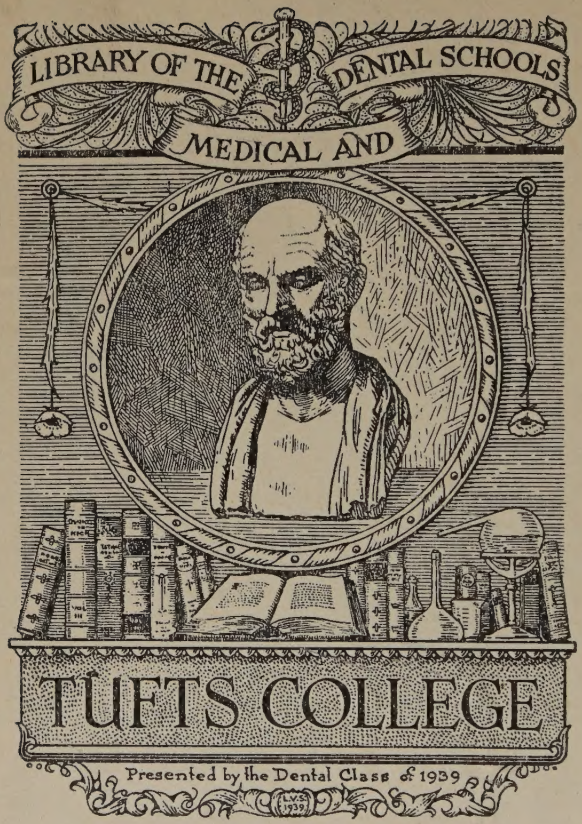
RESEARCH AND MEDICAL PROGRESS AND OTHER ADDRESSES

J. SHELTON HORSLEY



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RESEARCH AND MEDICAL PROGRESS AND OTHER ADDRESSES

Research and Medical Progress and Other Addresses

BY
J. SHELTON HORSLEY, M.D.
Attending Surgeon, St. Elizabeth's Hospital, Richmond, Va.

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TO THE

EX-INTERNS OF ST. ELIZABETH'S HOSPITAL

RICHMOND, VIRGINIA,

This Little Volume is Affectionately Dedicated

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RESEARCH AND MEDICAL PROGRESS AND OTHER ADDRESSES

CHAPTER I

RESEARCH AND MEDICAL PROGRESS*

THE subject of this address seems appropriate before the Southern Medical Association, because one of its chief policies has always been encouragement of research. Only a few years after this association was founded, a medal for original research was provided to be awarded to any member whose work in the opinion of the council seemed to merit it. The attitude of the officers of the association and of the various sections, the kind of programs provided, and the establishment of an independent Section on Pathology also show the emphasis that has been laid upon the fundamental sciences and upon research in medicine.

Many men and women throughout the South have attempted by lectures and by laboratory and clinical work to demonstrate the intimate connection between chemistry, physics, pathology and various phases of biology, and the diseases of human beings. The tendency to regard the fundamental sciences as something separate and apart from clinical medicine

*President's Address, Southern Medical Association, Twenty-First Annual Meeting, Memphis, Tennessee, November 14-17, 1927.

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is unfortunate, and happily is waning. The student who believes that studies in anatomy, embryology, chemistry, physiology and pathology should cease after the first two years of his course and should be remembered only for purposes of passing his examinations can never attain a full grasp of scientific medicine.

The *art* of medicine may sometimes be glorified unduly, and there is also such a thing as emphasizing overmuch the *science* of medicine. But who can say just where the science ends and the art begins? These two gradually merge into each other and both are essential for a full comprehension of medicine. That the careful taking of a clinical history and correctly registering the physical signs obtained through auscultation, palpation or percussion are largely an art is generally conceded. The memory of previous clinical cases, of the general attitude and expression of the patient, and the performance of technical procedures in surgical operations, may also be classified under the head of an art. And yet orderly knowledge and deductions from known facts, the proper arrangement of the history obtained from the patient, the correct interpretation of physical signs and the making of a logical diagnosis partake of the scientific method just as much as the calculation of a basal metabolism, the analysis of gastric contents, or the estimation of the carbon dioxide or the volume of the blood.

The individual who practices medicine or any of its specialties in a routine way by applying certain definite remedies and expecting definite results, much like dropping a nickel in a slot to get a bar of chocolate, may often be confused and perplexed when things go somewhat wrong. To do nothing but carry out a standardized technical procedure, such as the performance of an ordinary surgical operation, manipulations about the nose and throat, or the routine administration of certain drugs to "jog" the liver, is comparable to the part of the worker in a Ford assembling plant who is assigned solely to the business of turning bolt No. 6 a thousand times a day. One so limited to a narrow mechanical field of the art of medicine may lose interest in the wonderful biologic processes in the tissues he is attempting to repair.

No real progress in medicine has ever been made without research. There can be no progress in medicine when there is a fixed creed. A creed in medicine means that all future practice and therapy shall be based upon certain doctrines and rules that have been formulated and beyond which it is heresy to go. The practice of the Middle Ages, horrible as it may seem, would now be in vogue if all that concerned medicine had been confined to a creed. Black death, the ravages of smallpox, the sacrifice of the young by typhoid and diphtheria, the waste of life and energy by malaria and hookworm would still

be in progress. Too frequently we fail to recognize the blessings that we have. To those of us who remember twenty-five or more years ago, when little children strangled from membranous diphtheria, when many of the youth of the land were taken by typhoid, when malaria was believed to be a product of miasma, when epidemics and scourges were considered as due to some mysterious curse of God, modern conditions appear almost miraculous.

The problem whether the saving of those who otherwise would perish is a perpetuation of the weak and undesirable is, at present, impossible of solution. The physically weak are not always the undesirable, and the physically strong are sometimes the most vicious citizens of the community. The application of eugenics at this time seems far from accomplishment, though it can be readily imagined that an incomparable race of human beings might in future ages be brought forth by the tenets of eugenics. The mere lengthening of the cycle of existence should not be the only, even if it be the chief, aim of medicine. If life is prolonged fifteen or twenty years, what is to be done with this added period of existence? This very rightly concerns modern medicine. Prescribing correct habits of living and proper mental attitudes, and the inculcation of higher ideals to make life worth while through the applications of psychology and of psychiatry, are just as much the practice of medicine as the admin-

istration of diphtheria antitoxin or the removal of a gangrenous appendix. And these problems can be settled not solely by didactic discussion or by heated controversy to sustain unproved theories, but through actual observation of individuals and of communities.

Scientific medicine may be said to have had its foundation in the discoveries of William Harvey. His work on the motion of the heart and of the blood in animals is still a classic of accurate observation and logical deduction. It is difficult to conceive of correct clinical conceptions on the theory that the blood did not circulate and that the arteries contained air. Though Harvey's book was published in 1628, he had doubtless been teaching his doctrines for several years before that. Probably his students were instructed as to the true nature of the circulation as early as 1616, the year when Shakespeare died. Harvey carefully worked out his experiments, inviting criticism of all kinds and weighing the objections that were made. The announcement of his discovery created violent opposition, chiefly among the older physicians, and it is said that patients feared to trust a man who was accused of being not only ignorant but mentally unbalanced, and of announcing new and dangerous doctrines. The support of Charles I in appointing Harvey his personal physician did much to secure recognition for Harvey's wonderful work.

In order to complete his theory, Harvey had to assume that capillaries existed, minute vessels that transmitted the blood from the small arteries to the small veins. During Harvey's life these capillaries were unknown, and their presence was assumed as a tentative part of his theory of the circulation. The vision that he had and the accuracy of his observations and deductions are shown by the fact that the capillaries were soon demonstrated, for Malpighi announced the discovery of capillaries four years after Harvey's death, and thirty-three years after Harvey's treatise on the motion of the heart and blood in animals had been published.

Time does not permit me even to catalogue the numerous important advances in medicine since the epoch-making work of Harvey. The work of Pasteur, and of Koch, the applications of their bacteriologic researches to clinical surgery by Lister, the working out of the various vaccines, toxins and antitoxins, the discovery of the hormones of the body, of the deficiencies and excesses in internal secretions, and of the vitamines in food, have followed upon one another. Laboratory methods, chemistry, physics and biology have usually paved the way for many of these discoveries.

Directly or indirectly, all of these advances sooner or later have been based upon work on living tissue, either upon animals in the laboratory or upon the effects of the remedies or new methods upon those who discovered them or upon their assistants.

What a puny figure the claims of the antivivisectors cut in the face of the heroic and willing sacrifice of their own lives by Lazear while investigating yellow fever, by Yersin and Muller while studying bubonic plague, by Carbone while investigating Malta fever, by Ricketts while working on tabardillo, and by McClintick when searching for the cause of Rocky Mountain fever! There stand out as inspirations for courage the constant and repeated experiments upon themselves of numerous investigators, and the deaths from slow and malignant cancer of the early workers in x-ray, men who have given their own lives that others might be saved! Yet, with such examples by the pioneers of research, does it not seem strange that those who complain of research work on animals as unjustifiable should disregard these noble human sacrifices of health and of life and continue to adorn themselves with plumes plucked from beautiful birds killed for the millinery establishments, to wear the furs of animals slaughtered for their pelts, to delight in the juicy steak of a young steer butchered that its flesh may be food, or in the delectable fried chicken whose neck has recently been wrung by the cook in the back yard? I do not hold that every one should be a vegetarian; it seems probable that for some human beings at least animal diet is necessary for health, and that the taking of animal life for providing food, reprehensible as it may appear from some aspects, is

essential to the welfare of many men and women. But it is difficult to conceive the mental attitude of one who indulges in animal diet and in the products that are derived from the slaughter of animals, and yet objects to the painless performance of a few animal experiments that may save countless human lives.

Aside from the obvious necessity of obtaining certain biologic remedies, such as toxins and antitoxins, from animals, actual experience in the technic of surgical operations and of new procedures is essential for professional competency. Who would care for a young surgeon to remove a section of intestine from a patient when the operator had never done this operation except possibly upon the lifeless tissues of a cadaver? The performance of a few operations on dogs, permitting the dogs to live a sufficient length of time to demonstrate possible errors in technic, is an excellent test of the operator's efficiency. If the dog dies, a postmortem is held and technical errors are recognized and corrected in future experiments. When the young surgeon finds that on animals he is able to do this operation successfully in a series of experiments, then the operation can be undertaken by him with reasonable safety upon the human being. The animals are operated upon under anesthesia, they suffer comparatively little after the operation, as their sensitiveness is not as great as that of man, and they

are killed under an anesthetic. It would seem a higher ideal to improve one's technic by operations upon animals in order to increase his ability to save human suffering and human lives than to slaughter animals merely for food or for the sport of the chase.

Research is often unconsciously associated with laboratories, retorts, test tubes and instruments of precision. Much investigation, of course, is done in this way, and yet research after all chiefly depends upon the state of mind. It is the cultivation and the following of a scientific curiosity that wishes to find how and why the wheels go around, to ascertain the facts and truths of nature as they are, and not necessarily as some one else says they are. To be sure, authority should not be neglected, but the weight of authority depends more upon accuracy of observation and of deduction than upon the rhetorical excellences of the description.

Many of the greatest researches in medicine have been made by the general practitioner, and often by the country practitioner. Koch, for instance, was a Prussian country doctor. Crawford W. Long was a country physician in Georgia. Jenner was an ordinary practicing physician. Marion Sims was a country doctor whose vision of healing vesico-vaginal fistulas was stimulated by observing a small wire spring from which as a model he constructed fine silver wire. And if it be said that these dis-

coveries were in times when laboratories were not rampant and when scientific instruction was not abundant, I will recall to your mind the recent life of Sir James Mackenzie. His life and his works have been a great inspiration to modern medicine. A most readable biography, *The Beloved Physician,* by Wilson, first published in 1926, gives the essential facts of his career.

Mackenzie was born in Pickstonhill, Scotland, where his parents lived. He called himself a dunce, but, though he did not do well at school, his criticism is unnecessarily severe. Being uninterested in the studies at school, he induced his father to apprentice him to a pharmacist. After this he studied medicine but did not shine in his classes until the clinical part of the work was reached. He began the general practice of medicine in Burnley, a small town in Scotland, where there was but little immigration and where families lived for generations. In one of his early cases, the wife of a friend died suddenly of some cardiac condition during childbirth while Mackenzie was attending her. He agonized over this greatly and concluded that he should have known the cause of the approaching catastrophe. The common textbooks of the authorities gave no help. He began then by making accurate observations. He studied the pulse. He devised a tracing machine which eventually became the polygraph. Nothing, however, would make him more indignant than to be known as the inventor of the polygraph.

He said that this was merely a mechanical device of some convenience, but the main thing was the observation of the patient and the patient's condition. He differentiated cases of rapid heart in the young and certain extrasystoles in the old, and by watching these cases for years and seeing the results he found these two conditions were practically harmless and needed no treatment. He said if he had discovered a drug that would have relieved these affections his fame would have been notable, but having found out that while formerly treated as serious cardiac conditions they required no remedy, his discovery was disregarded. His book on *Symptoms and Their Interpretation* is a classic of observation and deduction, and reminds us of that noted book by Hilton, *Rest and Pain.*

It is remarkable that, while the great work of this country doctor received the intellectual homage of the teachers of medicine, they themselves with all their opportunities and facilities for scientific work had overlooked important fundamental facts on the pathologic physiology of the heart that Mackenzie had discovered. This research of great significance and value was done in modern times, not by professors in great universities, but by a simple country doctor to whose office the famous clinicians in the world later journeyed to learn. The following incident illustrates the attitude of Mackenzie upon the important part that the general practitioner

plays: The biographer states that an American physician had asked to be introduced to "the great Mackenzie." This devoted admirer talked to Mackenzie about the electrocardiograph and the meaning of the waves produced by it, and spoke much about the "Q-wave." He finally asked Mackenzie what line of research he would advise the American physician to take up. Mackenzie replied rather wearily, "I advise you to go into general practice and stay there for ten years." This astonished the American, and Sir James continued: "It is only in general practice that a man can learn how to foresee danger to his patient and how to prevent it."

On another occasion a research worker explained to Mackenzie that he was not certain whether small blood vessels of the skin were under nervous control. He had attempted to study this by examining the web of a frog's foot under the microscope, and said that the blood could be seen moving in the small vessels of the web. Mackenzie nodded and observed, "One can also see a girl blushing when the name of her lover is mentioned," a practical clinical observation which showed undoubtedly that the blood vessels of the skin are under the control of the nerves.

Mackenzie went to London where there was much opposition to him, but eventually he triumphed, being recognized by the greatest medical societies in England. Wishing, however, to get back to the in-

cipiency of things, he returned to Scotland and, with the financial aid of his friends, founded an institute for studying the beginnings of disease. He died of angina at the age of 71 years. Surely such a life in our own times and under the difficulties of early poverty and of scanty intellectual training must be an inspiration to every one.

Every medical man, whether a general practitioner or a specialist, should have some research problem, however simple it may be, under consideration. Thus Mackenzie has pointed out that the nature of pain and the mechanism of many symptoms are still unknown, and those who are in the best positions to solve these problems are the physicians who deal with patients in the early stages of disease. The reaction of the emotions, the type and distribution of pain in visceral diseases, the nature of the healing of wounds, the appearance of granulation tissue according to the type of infection or of the systemic disease, the cause of the absence of urethral discharge in gonorrhea when the testicle and epididymis become involved, the idiosyncrasies of different individuals not only to allergic material but to bacteria or other pathogenic factors, and many similar problems, can be greatly illuminated by the careful observations of a well-trained medical man.

In a sense, every necropsy is research work, because no full necropsy fails to uncover something of the unexpected. It may be obvious that a death

was from cancer of the stomach, but the routes by which the cancer spread, the number and location of the metastases and the appearance of the histologic structure may often be demonstrated in the necropsy as something rather different from what had been anticipated. Deaths from unknown cause make an even greater demand for postmortem examinations. As W. J. Mayo has said, persons die from very real things. Neurasthenia, heart failure, malnutrition may occur, but in surgical practice at least they are usually not justifiable causes for death, and a necropsy after an unexplained death aften uncovers previously unknown causes. This, at least, has been my experience in numerous instances.

I recall a patient on whom I did a gastroenterostomy for duodenal ulcer. The duodenum was infiltrated with exudate and over it was plastered the gall bladder. I separated the adherent gall bladder, and finding that the exudate in the duodenum was firm and brawny I did not attempt to replace the gall bladder. A posterior gastroenterostomy was done. The patient did well until the second day, when he rather suddenly developed pain in the upper abdomen which was not, however, very marked, but which was accompanied by a rapid rise in pulse rate and a fall in blood pressure. Medical examination showed that the lungs were not affected. He was given intravenously digitalis, which improved the condition somewhat. The blood count was not much above normal. We were about to take him to the operating room for abdominal exploration when he died within twelve hours from the onset of the ominous symptoms. The cause of death was obscure. The lack of severe pain, the very slight elevation of the white blood count and the rapid failure of the heart made the condition puzzling.

Necropsy showed that the abdomen was quite full of bile and

gastric juice which poured from a small round opening in that part of the duodenum from which the gall bladder had been freed. Evidently the patient had had an ulcer of the duodenum that had almost perforated, but the gall bladder had protected the peritoneal cavity. The exudate was thick and brawny. When I separated the adhesions of the gall bladder I unconsciously removed its protecting influence and the exudate over the ulcer was then digested. The gastric and duodenal contents were probably sterile, so that there was not the usual rise in the white blood cell count that would be found in septic peritonitis. The operation and previous inflammatory reactions and exudate doubtless obscured the acuteness of the pain. The patient died apparently from a kind of chemical shock due to the extensive contact of the gastric juice and bile with the peritoneal cavity.

A few months later I operated upon a similar case and with this unhappy experience in mind I did not separate the gall bladder, but on the contrary sutured some omentum around it, and then did a gastroenterostomy. This patient recovered.

Since then I have had other like cases. Finding out the facts and solving the problem of this unusual death saved the lives of others so that the dead did not die in vain. This type of research is open to every doctor. It is necessary to educate public opinion to the great importance of postmortem examinations, particularly in cases where the cause of death may be somewhat obscure.

In a paper read by Professor A. J. Carlson, of the University of Chicago, before the American Association for the Advancement of Science, December, 1926, the thesis was maintained that research work should be adopted as a method of general education. He thinks that the present day educational methods are largely devices for imparting information, and that in every form of education

some problem whose answer is unknown should be included. He does not expect to make research men or women out of all of the students, but he thinks that while a student should profit by past experience and by the knowledge that has been stored in books,

"... at every stage of education the student should be permitted, if not compelled, as a part of the program, to answer questions, not from books or lectures, but by field investigation or laboratory experimentation, to the end that the scientific method may become as fixed and as natural in his behavior as breathing."

Surely a mental training based upon the principle that problems must be solved with an eye single to the truth must have a great effect upon the character of the student. Those raised in such an atmosphere should become truthful, courageous and upstanding citizens.

Carlson says:

"An 'educated' man is supposed to have a certain fund of information plus a certain controlled behavior or disciplined emotions. He is supposed to have acquired a certain degree of critical judgment as a matter of automatic cerebration; a certain method of arriving at conclusions by analysis. He is supposed to weigh evidence, to keep an open mind in regard to the unknown. When we survey the behavior of humans today, it is very obvious that critical judgment, except in matters of immediate practical interest to the individual, is largely conspicuous by its absence. The scientific method has not yet become a tool in everyday human behavior. We know more facts than ever before, but on the whole we do not seem to be much wiser, more sane and more just than our more ignorant ancestors. This applies to the so-called educated members of society as well as to those who have come in the least contact with the formal educational processes of today."

If every member of the medical profession were to ponder on all these things and would undertake some problem of research, no matter how simple, carry it with him during his daily routine and ask counsel from those who he thinks could help, it would add a stimulus, a happiness, an efficiency to his work that can be obtained in no other way. The members of the medical profession in the South, from the days of Ephraim McDowell through the work of Marion Sims, of Crawford W. Long, of Walter Reed, of Henry R. Carter, of William S. Halsted, to the present generation with the splendid researches of Matas, of Evarts Graham and his associates, and of our recent ex-president, Charles C. Bass, not to mention scores of others, have shown that there have been and are men and women in the South capable of real research in medicine. The field is now white for the harvest. The sciences have pushed forward the frontier of knowledge, and instead of despairing of anything new because of the laboratory workers, there remain even greater opportunities for the general practitioner and for the specialists to apply the advances of the pure sciences to clinical medicine and its problems, just as Lister did the work of Pasteur, and as numerous sanatarians and clinicians have applied the knowledge obtained by the bacteriologists, the entomologists, the chemists and the physicists to the relief of human misery and to the saving of human lives.

CHAPTER II

PHYSIOLOGY AND MODERN SURGERY*

A SURGEON, like a practitioner of any branch of medicine is in a sense a biologist, for he is dealing with living tissue. The mechanical features of surgery have often been too much glorified. They are, to be sure, important, but a knowledge of the physiologic processes in the human body is equally essential. A patient who dies because the surgeon transplanted the ureters into the small intestine, where absorption is rapid, instead of into the rectum or sigmoid, whose function is chiefly receptacular, is just as dead as one who succumbs because of a defective intestinal suture or a poorly tied blood vessel.

Successful surgery does not mean just the skilful mechanical performance of an operation. It is something even more important than this. It involves the consciousness of the surgeon that the technical steps are not an end in themselves but are more or less important guides toward the correction of abnormal processes in living tissue. An appreciation of function presupposes, of course, a

*Chairman's address, read before the Section on Surgery, General and Abdominal, at the Seventy-Ninth Annual Session of the American Medical Association, Minneapolis, June 14, 1928.

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knowledge of structure, but a knowledge of structure alone, as of anatomy, may sometimes give an inadequate conception of the real function.

Tissue that from a structural standpoint apparently might substitute for other tissue in repairing defects cannot always be successfully used because of the absence of qualities which tend to adapt tissues to other than their normal environment. For example, attempted reconstruction of the ureter with fascia occasionally results in the fascia being converted into bone, not merely the deposit of calcium salts but the actual histologic structure of bone. Repair of the common bile duct with a segment of a vein, while from an anatomic standpoint seemingly suitable because the nutrition of the thin wall of the vein can be easily maintained, does not succeed, for the wall of the vein becomes irritated by the bile and cicatricial contraction ensues. Tissues accustomed to the presence of bile, as from the duodenum, are better substitutes for the duct than the thinner structure whose function is quite different. The ribs and costal cartilage, which have the static function of maintaining the general form of the chest similar to the function of the bones that preserve the contour of the face, furnish a graft that is more likely to be permanently successful when placed in the nose than a transplant of bone from the leg, where the function is not so static but is subject to quick changes of stress and strain.

Specialism in medicine has advanced knowledge in many respects, but too strict specialism is not without its disadvantages. The arbitrary division of patients into medical and surgical cases is fraught with some danger. Unless one who deals with disease has a broad conception of the underlying biologic processes that go on normally, he cannot hope intelligently to correct the abnormal processes—and this is equally true whether the case is surgical or medical. The particular treatment that is employed in the individual case should be indicated by the phenomena of the disease, and not by the desires of the practitioner. Some one has said that a specialist is one who "knows more and more about less and less." Such an intensive study and a progressively contracting field will often illuminate a single point and show facts that have not heretofore been discovered, but it is also possible that the proper proportion of the other features of the case may be distorted by the intense application in one limited region.

Modern surgery is always associated with the name of Lister, who undoubtedly is the father of modern surgery. But Lister's part in the important rôle he has played was not merely accidental. Sir Clifford Allbutt has said, "Though Lister saw the vast importance of the discoveries of Pasteur, he saw it because he was watching on the heights; and he was watching there alone." In an address

by Prof. John Tait[1] on "Lister as Physiologist," attention is called to the fact that from his earliest career Lister was interested in experimental work, particularly in experimental physiology. In his Huxley lecture in 1900, Lister said that at the University College he was attracted by the lectures of Dr. Sharpey, the professor of physiology, and these lectures inspired in him a love of physiology which never left him. The quantity and quality of Lister's investigations in pure physiology are remarkable, and Tait calls attention to the fact that this work of Lister's has often been overlooked. Much of his physiologic research was done with the help of his wife in the back kitchen of the dwelling in Rutland Street in which they started housekeeping. Like John Hunter, he was an inveterate worker and secured a large part of his material from the butchers. His researches were thorough, well thought out and carefully executed. They included investigation into the structure of plain muscle and of nerve fibers, the method of the flow of lacteal fluid in the mesentery, the nervous control of the arteries, the function of the nerves to the viscera, the phenomena of inflammation and of coagulation of blood, and the cutaneous pigmentary system of the frog. His research on the coagulation of the blood was typical of his work. This problem has not yet been definitely settled, and has always attracted attention. In Lister's time one of the outstanding theories of

the coagulation of the blood was that it was due to the escape of a small amount of ammonia which was supposed to be constant in the blood stream. In order to determine whether this was true, he constructed an apparatus consisting of rubber tubes connecting short segments of glass tubes. One end of this was inserted into a vein and the blood was allowed to flow through, when the rubber tubes connecting the glass segments were quickly tied, thus preventing the escape of any ammonia that might have been present. When the blood promptly coagulated under these conditions it showed that it was not due to the escape of ammonia. He then studied the influence of an endothelial lining on clotting and the effect of foreign bodies on the blood. While the problem of coagulation has not yet been completely solved, Lister dispelled many of the fallacies held during his time as to the conception of coagulation of the blood.

His studies concerning inflammation and his application of Pasteur's discoveries to surgery were a direct and logical result of his physiologic and pathologic investigations. It was not, then, accidental that Lister was able intelligently to apply the discoveries of Pasteur to surgical operations.

It is impossible in the proper limits of an address even to mention all the many instances of the effects that physiologic discoveries have had on the practice of modern surgery. Researches concerning the

typing of blood for transfusion, the biochemistry of the blood stream, the action of the reticulo-endothelial system, and the effect of continuous intravenous infusion of dextrose solution, as brought out by Matas, have had a wide range of clinical usefulness. The continuous intravenous injection of a solution of pure dextrose in freshly distilled water, or with the addition of sufficient salts to make a Ringer's solution, is often a life-saving procedure. The injection of insulin at intervals, in order to prepare the body cells for the injected dextrose when the vitality of the tissues is at such a low ebb that insulin cannot be readily produced by the pancreas, is a valuable addition.

The method of promoting collateral circulation by the malleable bands of Halsted and of Matas, and the operation of von Oppel in threatened gangrene from arterial diseases in which the main vein is tied in order to keep the arterial capillaries filled with their blood for a longer time, are valuable researches. The operation of Dean Lewis,[2] in which the femoral artery is ligated below the profunda in order to increase the collateral circulation of the profunda in certain instances of threatened gangrene of the foot, shows the value of a knowledge of the circulatory changes that occur after arterial obstruction. A study of the process by which the blood supply to tissue may be built up has been of great value in plastic surgery. Blair[3] and others

have shown that the immediate transference of a flap even by the most skilful and gentle dissection, throwing the circulation at once on the pedicle, is often followed by gangrene of the flap. When, however, the dissection is made in stages and the circulation through the pedicle is gradually developed, the vitality of the flap will usually be maintained.

A knowledge of the biologic processes that go on around a foreign body in bone shows that the irritation by such a foreign body usually causes an absorption of the surrounding calcium salts in nature's effort to free the bone from the fixed foreign substance. A proper conception of this phenomenon has brought about one of the outstanding changes in surgery of the bone from the blacksmithing in which rivets, steel plates and screws were used in fractures. These create osteoporosis and, in spite of the accurate mechanical coaptation, tend to produce nonunion instead of union. Bone grafts, even though slender and though the immediate mechanical effect may be inferior, give eventually better results than the more accurate adjustment in which foreign bodies of steel are used.

The unfortunate effect of the disregard of physiologic function in surgical operations is seen in the number of instances in which fifteen or more years ago the colon was excised to cure chronic cystic mastitis, goiter or tuberculosis. While undoubtedly there are organic diseases of the colon aside from cancer which demand resection of this bowel, the

removal of a colon that shows little disease for the purpose of curing such unrelated diseases as those mentioned was, to say the least, illogical and can hardly by any stretch of the imagination have any basis in disturbed physiologic function.

One of the most striking examples of the influence of physiology on modern surgery is in the gastrointestinal tract. The researches of Cannon,[4] Carlson,[5] Ivy,[6] Luckhardt,[7] the Dragstedts,[8] Alvarez,[9] Klein,[10] Mann,[11] Morton[12] and others have changed many of the old conceptions of surgery of the stomach and intestine. We know now that hunger pains are accompanied by a contraction of the empty stomach—that peristaltic waves which concern the right half of the stomach are probably initiated along the lesser curvature near the esophagus and proceed as ripples to the middle of the body of the stomach, when they first become visible to fluoroscopic examination. We know, according to Carlson, that there is no such thing as hyperacidity of the gastric juice—that the normal gastric juice contains a maximum of 0.5 per cent of hydrochloric acid. The regurgitation of the alkaline duodenal contents into the stomach toward the end of digestion is a normal process and tends to lessen the acidity of the gastric juice. The chief alkaline material in the duodenal contents is the pancreatic secretion, and this, too, is affected to some extent by the quantity of acid in the stomach.

Obstruction at the pyloric end of the stomach may be organic, as from a stricture, or from excessive spasm. Anything that prolongs the contact of food with the gastric mucosa tends to increase the quantity of gastric secretion. Ivy has shown experimentally that after a pyloric stenosis there may be a temporary decrease in gastric secretion, probably partly from dehydration, and after this usually gastric secretion increases. The gastric secretion is due, among other things, to the contact of food and its digested products with the gastric mucosa, to mechanical distention, and also to the action of the expelled gastric contents on the intestinal mucosa. It is therefore readily seen that incomplete obstruction at the pylorus will increase the secretion of the gastric juice by prolonging the contact of food with the gastric mucosa, by the distention of the stomach, and by the slow ejection of chyme from the stomach, which thereby prolongs the contact of chyme with the intestine and so gives a reflex for a longer time.

Olch and Elman[13] have demonstrated experimentally that reduction of the normal tone and spasm of the pylorus by resecting the vagus nerve, as done by Walter Hughson[14] in pylorospasm, makes not only a quicker emptying time of the stomach in the experimental animal but also more rapid neutralization of the acid of the gastric juice. They conclude as follows:

"We next subjected normal animals to either gastroenterostomy, Polya-Balfour resection, or pyloroplasty. In all these instances there is decreased emptying and quicker neutralization, and this is particularly the case following pyloroplasty or resection. The neutralization in the gastroenterostomy was about the same as after vagotomy."

This work seems to show that much of the lowering of acidity of the gastric juice after operation on the stomach is due to a more abundant reflux of the alkaline contents of the duodenum into the stomach.

The Portises[15] made a Pavlov pouch from the cardiac portion of the stomach in three dogs and later did a subtotal gastrectomy. Observations on the stomachs of these dogs at intervals for several months showed for each animal the absence of free hydrochloric acid but high combined acidity, while the secretion from the Pavlov pouch gave free hydrochloric acid both before and after gastrectomy. They conclude that the absence of free acid in the stomach after partial gastrectomy is due to neutralization of the acid by the duodenal contents, and also to the more rapid emptying of the remaining stomach after subtotal gastrectomy.

The well-known experiments of Mann demonstrated that so-called duodenal surgical drainage in which the duodenal contents, including its chief alkaline constituent, the pancreatic juice, are side-switched and the jejunum lower down is connected with the stomach, is usually followed by a typical

peptic ulcer in the bowel united to the stomach. Morton has shown that the gastric mucosa heals less readily and that gastric peptic ulcer in a dog often occurs after injury to the gastric mucosa when this duodenal surgical drainage has been done, whereas in control animals similar injuries to the gastric mucosa heal promptly.

Operations, then, which tend to deprive the segment of bowel united to the stomach of the protective influence of alkaline duodenal contents, or which remove the influence of the regurgitated duodenal contents on the gastric juice, are unphysiologic and seem to predispose toward ulcer of the bowel that is joined to the stomach or of the stomach itself. Operations that permit the abundant reflux of duodenal contents into the stomach tend to lower the acidity of the gastric juice, so that the absence of acid in the gastric juice after partial gastrectomies may be due not solely or chiefly to the removal of some of the acid-bearing tissue but to the more ready access of the duodenal contents to the cavity of the stomach.

In considering intestinal obstruction the difference in the normal behavior of the upper small intestine and the lower small intestine and the colon has been too frequently ignored, though it has long been a clinical observation that obstruction from a malignant growth in the large bowel is much better borne by the patient than obstruction in the upper

bowel. The difference in peristalsis, and in digestion and absorption of the normal contents of the upper small bowel and of the lower small bowel and the colon, bears on this problem. The work of Haden and Orr[16] in showing that obstruction in the upper small intestine is accompanied by marked destruction of proteins and a drop in the blood chlorides is valuable. The restoration of the chlorides of the blood as shown by them in acute obstruction of the upper small intestine is usually followed by rapid improvement of the patient and doubtless makes such changes in the perverted metabolism as would tend to counteract the effect of the toxic material from the intestinal obstruction.

Dragstedt has shown that toxic secretions in fluids of intestinal obstruction are powerful secretagogues, and when injected into dogs cause considerable increase in the secretion of the pancreas, the stomach and the intestine. According to Dragstedt it seems probable that the fall in blood chlorides in intestinal obstruction is due to the easy passage of the chlorides into the alimentary canal and their failure to be reabsorbed. The histamine-like products found in intestinal obstruction are present in a closed loop of obstructed bowel. The injection of histamine into dogs produces symptoms resembling those that occur after the injection of the fluids of intestinal obstruction.

The clinical bearing of the recent studies of the

physiology of the sympathetic nervous system has not yet been properly evaluated. The rôle of the sympathetic nerves in the transmission of pain, in the production of relaxation or of spasm in smooth muscular tissue, and in postural conditions in striped muscle is beginning to be appreciated by surgeons. While much unwarranted enthusiasm has arisen in the clinical application of some of this knowledge, undoubtedly surgical progress has been made in this direction. In properly selected cases the pain from angina pectoris has been relieved by operation on the cervical sympathetics; some cases of arterial spasm appear to have been benefited by "sympathectomy," or the removal of the adventitia of the large arteries, and recently Judd and Adson[17] reported remarkably beneficial results in two cases of Hirschsprung's disease in children after excision of the lumbar sympathetic ganglions. The cause of cardiospasm of the esophagus and of some dilatations of the duodenum may be due, as has been suggested by Devine[18] of Australia, to a derangement of a part of the sympathetic nervous system, which will necessitate a different method of surgical therapy from that now employed.

These are only a few of the many instances of the direct bearing of physiologic research on surgical progress. They are sufficient, however, to demonstrate the need of a knowledge of the biologic processes in the human body by any one who

attempts to restore health, particularly if such a restoration involves mechanical procedures which because of their very obviousness may obscure the biologic principles underlying them.

References

1. Tait, John: Lister as Physiologist, Science 66: 267, 1927.

2. Lewis, Dean, and Reichert, F. L.: Collateral Circulation in Thrombo-Angiitis Obliterans: Indication for Ligation of Femoral Artery Just Distal to Profunda, J. A. M. A. 87: 302-304, 1926.

3. Blair, V. P.: The Delayed Transfer of Long Pedicle Flaps in Plastic Surgery, Surg. Gynec. Obst. 33: 261-272, 1921.

4. Cannon, W. B.: Peristalsis, Segmentation and the Myenteric Reflex, Am. J. Physiol. 30: 114, 1912. Cannon, W. B., and Murphy, F. T.: The Movements of the Stomach and Intestine in Some Surgical Conditions, Ann. Surg. 43: 519, 1906. Cannon, W. B., and Blake, J. B.: Gastroenterostomy and Pyloroplasty, ibid. 41: 686, 1905. Cannon, W. B., and Washburn, A. L.: An Explanation of Hunger, Am. J. Physiol. 29: 441, 1912. Cannon, W. B.: The Mechanical Factors of Digestion, International Medical Monographs, London, 1911, Edward Arnold.

5. Carlson, A. J.: The Control of Hunger in Health and Disease, Chicago, University of Chicago Press, 1916; Secretion of Gastric Juice in Health and Disease, Physiol. Rev. 3: 1, 1923.

6. Ivy, A. C.: Contributions to the Physiology of the Stomach, Arch. Int. Med. 25: 6, 1920; The Newer Physiology of the Gastrointestinal Tract, Am. J. M. Sc. 173: 453, 1927. Ivy, A. C., and Farrell, J. I.: Contributions to the Physiology of Gastric Secretion, Am. J. Physiol. 74: 639, 1925. Droegemueller, E. H., and Meyer, J. L.: Effect of Experimental Pyloric Stenosis on Gastric Secretion, Arch. Int. Med. 40: 434, 1927.

7. Luckhardt, A. B., Phillips, H. T., and Carlson, A. J.: Contributions to the Physiology of the Stomach: The Control of the Pylorus, Am. J. Physiol. 50: 57, 1919.

8. Dragstedt, L. R.: Blood Chemistry in Intestinal Obstruction, Proc. Soc. Exper. Biol. & Med. 25: 239, 1928; Factors Controlling the Intestinal Bacteria, J. Infect. Dis. 31: 209, 1922. Dragstedt, L. R., Cannon, P. R., and Dragstedt, C. A.: Intestinal Obstruction, ibid. 27: 139, 1920. Dragstedt, L. R., and Vaughan, A. M.: Gastric Ulcer Studies, Arch. Surg. 8: 791, 1924.

9. Alvarez, W. C.: The Mechanics of the Digestive Tract, New York, 1922, Paul B. Hoeber, Bayliss and Starling's Law of the Myenteric Reflex, Am. J. Physiol. 69: 229, 1924. Alvarez, W. C. and Mahoney, Lucille J.: Peristaltic Rush in the Rabbit, ibid. 69: 211, 1924.

10. Klein, Eugene: Gastric Motility: I. The Origin and Character of Gastric Peristalsis, Arch. Surg. 12: 571, 1926; Gastric Motility: II. The Conduction of the Gastric Peristaltic Wave, ibid. 12: 583, 1926.

11. Mann, F. C., and Williamson, C. S.: The Experimental Production of Peptic Ulcer, Ann. Surg. 77: 409, 1923.

12. Morton, C. B.: Observations on Peptic Ulcer: I. A Method of Producing Chronic Gastric Ulcer: A Consideration of the Etiology, Ann. Surg. 85: 207, 1927; Observations on Peptic Ulcer: II. A Roentgenologic Study of Experimentally Produced Chronic Ulcers, ibid. 85: 222, 1927.

13. Olch, I. Y., and Elman, Robert: Regurgitation of Duodenal Contents as Factor in Neutralization of Gastric Acidity, Proc. Soc. Exper. Biol. & Med. 25: 184, 1927.

14. Hughson, Walter: Reflex Spasm of the Pylorus and Its Relation to Diseases of the Digestive Organs, Arch. Surg. 11: 136, 1925.

15. Portis, S. A., and Portis, Bernard: Effects of Subtotal Gastrectomy on Gastric Secretion, J. A. M. A. 86: 836-839, 1926.

16. Haden, R. L., and Orr, T. G.: Use of Sodium Chloride in Treatment of Intestinal Obstruction, J. A. M. A. 82: 1515, 1924; Effect of Inorganic Salts on Chemical Changes in Blood of Dog After Obstruction of Duodenum, J. Exper. Med. 39: 321, 1924.

17. Judd, E. S., and Adson, A. W.: Report of Our Experiences in Lumbar Sympathetic Ganglionectomy for Hirschsprung's Disease, read before the American Surgical Association, Washington, D. C., May 1, 1928.

18. Devine, H. B.: Basic Principles and Supreme Difficulties in Gastric Surgery, Surg. Gynec. Obst. 40: 1, 1925; correction 41: 688, 1925.

Additional References

Cutler, E. C., and Fine, Jacob: Sympathectomy in Angina Pectoris, J. A. M. A. 86: 1972, 1926.

Davis, Loyal, and Kanavel, A. B.: The Effect of Sympathectomy in Spastic Paralysis of the Extremities, J. A. M. A. 86: 1890, 1926.

Forbes, Alexander, and Cobb, Stanley: Physiology of Sympathetic Nervous System in Relation to Certain Surgical Problems, J. A. M. A. 86: 1884, 1926.

Horsley, J. S.: Reconstruction of the Common Bile Duct, J. A. M. A. 71: 1188, 1918.

Lane, W. A.: The Hunterian Lecture on Colectomy, Lancet 1: 207, 1921.

McNealy, R. W.: Periarterial Sympathectomy, J. A. M. A. 86: 1968, 1926.

Ranson, S. W.: Anatomy of the Sympathetic Nervous System: With Reference to Sympathectomy and Ramisection, J. A. M. A. 86: 1886, 1926.

CHAPTER III

THE INFLUENCE OF PHYSIOLOGIC RESEARCH ON MODERN SURGERY*

IT SEEMS appropriate in the tercentennial of the publication of the classic monograph by William Harvey on the motion of the heart and blood in animals not only to review the advance made in physiology as a science but also to emphasize the important influence of this advance on clinical medicine and surgery. It is not possible within the limits of an address even to mention the numerous instances by which the conceptions of disease and the methods of treatment have been directly or indirectly influenced by some research in physiology. Researches of this kind are not necessarily always in a laboratory on experimental animals. Careful clinical observations are sometimes capable of evolving new biologic principles. This has been notable in the life of the late Sir James Mackenzie, who in the isolated Scotch village of Burnley, and with no training other than that of the average medical student of his day, solved many of the perplexing clinical problems concerning the heart, contributed greatly to a physiologic knowledge of the normal

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function of the heart, and made interesting observations on pain.

There is no work on pain that does not profoundly affect clinical medicine in all of its branches. Much remains to be known of the cause and distribution of pain in the sympathetics and in their connections. Observation of the very early stages of a disease and deductions made from cases accurately studied, doubtless will prove of value in determining the distribution and cause of pain in this disease.

Homer Swift says that all medicine is in a sense experimental. "By this it was meant to imply that it is necessary for the physician, whether in the laboratory or at the bedside, to approach his problem from the experimental viewpoint. Only by postulating that we know all about a disease or all about a sick man dare we conclude that we have the necessary knowledge which will enable us to control all the symptoms, that is, the phenomena of disease. No one would be so rash as to claim such knowledge. Why, then, should he be so bold as to approach either a sick man or the problem of disease in any attitude but that of the scientist?"

Disease, according to Professor C. A. L. Evans, is a departure from normal which threatens life or which in some way reduces its value. The symptoms of the disease are sometimes due to a cessation or an increase of function, or to an adaptation

of a compensatory nature. These may be atrophy or hypertrophy of an organ, as a decrease or an increase of function. A study of this function often may be carried on clinically, but the fundamental basis in many instances now, as formerly, depends upon experimental research. William Harvey said, "At length, and by using greater and daily diligence, having frequent recourse to vivisections, employing a variety of animals for the purpose, and collating numerous observations, I thought that I had attained to the truth, that I should extricate myself and escape from this labyrinth and that I had discovered what I so much desired, both the motion and the use of the heart and arteries."

It is difficult to disassociate art and science in medicine or surgery. They blend into each other. The mechanical and technical procedures in surgery, the taking of a history and obtaining physical signs, may be called an art, but the proper interpretation of the condition of the tissues, the correlation of the history and the clinical findings secured by palpation, inspection or auscultation into a logical diagnosis and the application of this knowledge to the treatment of the case, involves a mixture of science and art that is too intimate to unravel.

The instances of clinical disasters that have occurred from ignoring physiologic function are unfortunately numerous. The days when the ovaries

of women were removed for a slight pretext, such as dysmenorrhea, menorrhagia, or metrorrhagia, headaches, backaches, and various groups of nervous symptoms, have passed. These operations often left in their trail nervous wrecks whose lives were more miserable after the operation than before, the remedy being far worse than the disease. In more modern times the excision of the colon to cure various troubles, from goiter to chronic cystic mastitis, has also had its vogue but has happily been abandoned for such purposes. The repair of defects in the palate by turning in large flaps of tissue without considering the function of the muscles of the soft palate may result in a mechanical occlusion of the cleft, but the possibility of function of the muscles has too often been thereby destroyed. The setting of fractured bones with large metal plates tends to retard bony healing, because it is based chiefly on mechanical concepts, repairing bone as a carpenter would mend a piece of broken timber, without regard to the fact that foreign irritating substances in bone cause an osteoporosis. Frequently nature's abundant efforts have prevented failure of union by throwing out a sufficient amount of callus in the bony tissue at a distance from the plate. Recently certain operations upon the sympathetic system have often afforded relief from pain, but undoubtedly many operative pro-

cedures in this field have been undertaken on too little physiologic basis.

The problem of the application of surgery to the gastrointestinal tract is always a pressing one because such opportunities are abundant. No longer does the surgical treatment of every lesion of the stomach consist in doing a gastroenterostomy, though this operation has a distinct and wide field in properly selected cases. It remains to be seen whether the swing to the other extreme of extensive subtotal gastrectomies for even a small duodenal ulcer will prove satisfactory. Certainly the abolition of all acid gastric secretion for the cure of a comparatively small lesion cannot always be considered a desirable thing. Aside from its rôle in digestion, the antiseptic effect of hydrochloric acid is marked. While the gastric juice is not as important as it was formerly considered, it is probable that the deprivation of a large amount of healthy gastric tissue is not consistent with normal health in all patients. It would seem more logical to make the operation fit the pathology, rather than to adopt a standard method of procedure for every lesion. The failure to cure by gastroenterostomy when applied indiscriminately to all gastric lesions would doubtless also appear when all gastric lesions are subjected to a far more radical operation. That there are certain instances in which radical operation is indicated is, of course, obvious. It would seem preferable to perform a less extensive opera-

tion in mild cases, preserving as far as possible physiologic function, with the knowledge that a small percentage of these cases will have a recurrence of the ulcer, than to undertake the radical operation in the first instance in all cases. The radical operation can then be applied to the small percentage of recurrences.

It has been shown by Ivy and Farrell that the secretion of gastric juice is stimulated by some material circulating in the blood. In a female dog, Ivy transplanted a portion of the stomach to tissues beneath the mammary glands, doing the operation in stages in order to develop a blood supply to the transplant. When the transplanted part of the stomach had been disconnected it was found that feeding the dog normally would produce from the isolated pouch a certain amount of secretion of gastric juice containing hydrochloric acid and pepsin. Of course there are other stimulants for gastric juice besides this, but the determination of a humoral stimulant for the hydrochloric acid in the gastric juice is also interesting from a clinical view, as many diseases are accompanied or preceded by achlorhydria, and it seems that they may in some way destroy or neutralize this normal blood stimulant.

The absence of hydrochloric acid in the gastric juice for a long period of time is undoubtedly a potential handicap to health even though appar-

ently there may be no symptoms. Donald R. Black has found that from 7 to 10 per cent of routine gastric analyses show achlorhydria. It has long been known that achlorhydria is present in pernicious anemia, and that it precedes the typical blood findings of this disease by months and sometimes by years. Such other diseases as anorexia, abdominal distention, diarrhea, urticaria, arthritis deformans, and myocarditis have been attributed to achlorhydria, and yet they are often found in patients whose gastric secretion is normal. The association of sclerosis of the spinal cord with achlorhydria has been particularly striking, as this disease has often been found to accompany pernicious anemia.

The absence of hydrochloric acid in the gastric juice permits the accumulation of bacteria in the upper intestinal tract. In cancer of the stomach the achlorhydria is a marked feature. In operations upon such cases the risk is distinctly greater because of the possibility of sepsis from the stomach, whose normal acid gastric secretion would have a marked antiseptic effect.

Following the suggestion of Dr. W. H. Higgins, attending physician to St. Elizabeth's Hospital, we give dilute hydrochloric acid in cases of cancer of the stomach before an operation. In order to insure a fairly constant supply of free hydrochloric acid in the stomach, 6 drams of the official dilute

acid are given in three pints of water daily for two days prior to the operation. Small quantities of this solution are taken hourly, and not as usually prescribed after meals. In cases of pyloric obstruction frequent lavages with 0.5 per cent hydrochloric acid may be substituted. In conditions in which surgery of the upper intestinal tract may be anticipated for a few days, this procedure would tend to lower the bacteria in the intestinal contents and even after emergency operations on the upper intestinal tract it may be advisable to administer hydrochloric acid in this manner.

The majority of gastric symptoms are due to a derangement of the motor mechanism rather than of the secretory apparatus. Walter Hughson, of the Johns Hopkins Hospital, has shown that in dogs there is a tendency to pyloric spasm following an injury to the peritoneum. This is a reflex spasm and the paths for this reflex arc are through the vagus nerve. After inducing the spasm and delayed emptying of the stomach by creating a lesion in the colon, he has caused normal emptying by resecting the vagus nerve, and finds that removing the branches of the vagus about the middle of the stomach where the vagus is more accessible has the same effect as when the nerve is severed immediately on entering the stomach. In some instances, particularly in connection with other operations, this procedure has a field. That it permits a quicker

emptying of the stomach and regurgitation of the alkaline contents of the duodenum to the gastric mucosa, so lowering or neutralizing gastric acidity, is shown by Olch and Elman.

The influence of physiologic research on intestinal surgery has been notable. The studies of Cannon, Alvarez, Dragstedt and others on the movement of the intestines have been most helpful in surgical practice. Alvarez has shown that the usual intestinal peristalsis is largely myogenic and that the inherent wave of contraction in the musculature of the upper jejunum is about 20 per minute, whereas it is about 11 per minute in the lower ileum. The upper intestinal tract is not only more rapid and sensitive in contraction but is more easily affected by adverse influences.

According to Alvarez, stimulation may accelerate the rate of contraction of the lower ileum and so peristalsis can be reversed, as in the vomiting from acute appendicitis in which the irritation is confined to the region around the lower ileum; or, on the other hand, toxic influences that would overwhelm the upper small intestine may not so adversely affect the lower small intestine or the colon where the musculature seems to be more hardy. In this way constitutional toxic causes may produce a marked impairment of motion in the upper small intestine, while not so profoundly affecting the lower small intestine, and so the same mechanical effect of reversed peristalsis will occur.

The great metabolic activity of the upper small intestine requires a large blood supply and much fluid. Obstruction in this region lessens absorption and causes pouring out through reversed peristalsis of the contents of the stomach and small intestines, and thus depletes the supply not only of water but also of chlorides.

The surgical application of these physiologic facts is that in operations on the upper intestine an ample lumen must be provided because obstruction here is not only more keenly felt by the sensitive musculature, but because among other things rapid dehydration and loss of chlorides which follows it may be quickly fatal. It is also evident that with only a few bacteria in the intestinal contents of the upper small intestines, from the effect of hydrochloric acid of the gastric juice, the lumen can be exposed more safely than in the lower small bowel and the colon where bacteria teem. The technical methods, then, must be altered to suit these conditions. The desideratum in the lower small intestine and the colon is to prevent contamination even if the lumen of the sutured bowel is not large. In the upper small intestine the indication is reversed.

The formation of calculi, particularly urinary calculi, has long excited interest. Osborne and Mendel about eleven years ago directed attention to the fact that often calculi appear in the urinary tract of rats used for nutrition studies, and that when-

ever such calculi were found it was where there had been an inadequate supply of vitamine A for some time. Fujimaki, of Tokyo, has more recently shown that rats fed with a diet deficient in vitamine A for a long time developed first bladder stones, then kidney stones, and finally stones in the bile ducts. The urinary stones are phosphatic, while the biliary stones are chiefly cholesterol. Deficiency in vitamine B apparently has nothing to do with the formation of stones, nor does the deficiency in protein in the diet seem to have this effect. After the stones have formed, as demonstrated by roentgenologic examination, they would in some instances disappear by altering the diet and including a large quantity of the fat soluble vitamines. Such treatment may in certain instances have a clinical bearing.

The study of the blood has been helpful in surgery, not only as regards diagnosis and prognosis, but also in indicating the treatment. The aid of physiologic research in typing blood for transfusion and in indicating the desirability of using fresh whole blood is well known. The hemorrhagic diseases or anemias that seem to depend upon the excessive destruction of the red blood cells or of the platelets by the spleen are greatly benefited by splenectomy, whereas other anemias which are not dependent chiefly upon the spleen may be actually harmed by this operation.

While the physiologic function of the spleen is not fully known, the unique nature of its blood supply in which the arterial system is independent of the venous, its active phagocytic cells, and its function as a filter, command our attention. W. L. Robinson, of Toronto, has written interestingly upon the filtering capacity of the spleen, and concludes that electrical conditions have much to do with the filtering. He says that the pores of the Berkefeld and Chamberlain filters vary between 0.38 and 0.45 μ., which are abundantly large for the passage of most bacteria, but that filtration occurs by the process of "adsorption of bacteria to the walls of the filter pore." When the electrical charge of the bacteria or the small particles is opposite that of the walls of the pores, filtration occurs. The Berkefeld and Chamberlain filters carry negative charges and consequently filter out positively charged bacteria or particles. According to Robinson, colloidal platinum and silver particles are negatively charged, whereas colloidal copper is positively charged. The spleen filters out the platinum and silver, but the copper passes through and no trace of it can be found in the splenic cells. The filtration by the spleen, then, appears to be largely of an electrophysical nature and is selective for this reason and not because of the vitality of the cells. The bearing of this may be important in the administration of intravenous remedies, and possibly

in the interpretation of the destruction of blood cells by the spleen in certain anemias.

The physiology of the blood serum has shown that there is a rather constant constituent of 0.1 to 0.2 per cent dextrose in the blood. This dextrose provides energy for the body and is the chief caloric source. The splendid work in Professor McLeod's laboratory by Banting and his colleagues has resulted in the explanation of the action of the internal pancreatic secretion and in the isolation of insulin, which promotes the utilization of dextrose by the body. These discoveries have opened a wide field for helpful remedies in both medicine and surgery. When the vital tide of the body is at a low ebb, as in shock, dextrose and Ringer's solution administered intravenously give the normal constituents of the salt in the serum plus dextrose, and the addition of insulin supplies an element which in the depressed vital state of the body the pancreas may not be able to produce in sufficient quantity to utilize the dextrose.

Andrews and Reuterskiold sum up the actual physiologic effect of insulin to be threefold: "(1) It promotes the storage of glycogen in the liver; (2) it converts glucose into some other hexose more readily oxidizable; (3) it brings about an increased affinity of tissue for water, thereby causing a concentration of the blood." After observing patients to whom insulin and dextrose were given after op-

eration, they conclude that for postoperative acidosis and dehydrated conditions, water and glucose alone are needed and insulin may be contraindicated. When administering the dextrose intravenously and continuously, however, it would seem that a small amount of insulin, not enough for all the dextrose in the injected fluid, would be helpful in making the remedy more efficient. The urine should be examined frequently, and whenever sugar appears the amount of insulin administered should be increased.

One of the greatest advances in recent years in the general treatment of toxic conditions is the continuous intravenous injection of dextrose solution, first advocated by Matas, who has made so many valuable original contributions to surgery. A 5 per cent dextrose solution in Ringer's solution may be given intravenously continuously for days. The dextrose solution must be pure, otherwise reactions may occur, and the same precautions must be taken to use freshly distilled water and a prepared tube as in other intravenous injections. We have given it three days in succession, having a buret so arranged that the flow can be accurately controlled. Usually an intravenous cannula is employed, but for a period of a few hours the intravenous hypodermic needle is often satisfactory. In cases of shock this method is of great value. If used in the early stages of approaching shock it is pre-

ventive, and is often a reliable remedy even after shock has been established. At any rate it will serve to maintain the blood pressure until a blood transfusion can be done.

It must be recalled that the conditions in shock and in sepsis are different. The chief phenomenon of shock is the lowered blood pressure due to lack of fluid in the vascular system, consequently fluid must be supplied quickly. The heart is not overstrained, but there is an insufficient amount of fluid upon which it must contract. In such instances 500 c.c. or more of dextrose solution can be given intravenously within a few minutes. As soon as the pulse picks up the rate of flow should be diminished and maintained only at such a level as is necessary to keep up a sufficient blood pressure. If this requires an undue amount of the solution after a few hours, blood transfusion should be done. About 1000 or 1500 c.c. can thus be administered intravenously in cases of shock within the course of two hours without any detrimental effect. If this rate of flow is continued longer, it is dangerous, and there is, of course, the possibility of edema of the lungs and of other complications which must be watched.

In sepsis or in dehydration, however, the intravenous administration of dextrose solution should be much slower. Usually an initial flow of 200 or 250 c.c. an hour is sufficient, and this should be

gradually cut down to 100 or 150 c.c. an hour. We have found that a flow of less than 100 c.c. an hour, even with an intravenous cannula, and especially with a hypodermic needle, permits the cannula or needle to clog. After every 500 c.c. of 5 per cent intravenous solution, 10 units of insulin are injected into the rubber tube. The administration of insulin with dextrose solution in shock was described by Fisher and Snell, who with Thalhimer, Ort, Irwin and others, advocated the use of dextrose with insulin in postoperative acidosis and toxemia.

Not only in toxic conditions and in shock, but also in operations upon the stomach or intestinal tract where physiologic rest of these viscera for repair is indicated, nutrition can be maintained for many days by this method, and more effectively and with much less discomfort than by either hypodermoclysis or rectal administrations. In many affections of the liver the administration of intravenous glucose with insulin is excellent therapy, for the burden of storing the carbohydrates and giving them off is one of the chief hepatic functions. By this method some physiologic rest for the liver is secured. In operations upon patients with hepatitis, which Evarts Graham has shown practically always accompanies inflammation of the gall bladder, the function of the liver may be greatly aided by the intravenous introduction of dextrose.

In obstruction of the upper intestinal tract there

is, according to Haden and Orr, a marked decrease in blood chlorides and an increase in the blood urea, and the intravenous administration of sodium chloride is helpful. They recommend that sodium chloride be given, one gram per kilogram of body weight as the initial does, then the chlorides in the blood should be watched to estimate subsequent doses. They first conceived that the beneficial action was due to the fact that the toxic material elaborated by the obstruction was neutralized by the sodium chloride. They have, however, abandoned this theory, and the more recent explanation is that low blood chlorides in obstruction are at least partly due to the loss of chlorides from vomiting or from pouring out into the stomach or intestine large quantities of fluid containing chlorides which on account of the pathologic condition are not readily absorbed. Practically the same blood changes are found after a duodenal fistula in which there is loss of gastric juice and of pancreatic juice, and the intravenous injection of saline solution is helpful in such cases.

The physiology of the sympathetic system is not yet definitely ascertained. Doubtless many operations on the sympathetics have been based upon an illogical interpretation of unproved theories, but there is a field for the surgical treatment of certain diseases that seem dependent upon abnormalities of the function of the sympathetic system. The

removal of the lower sympathetic lumbar ganglion in cases of megalocolon has proved in some instances beneficial. The extirpation of the colon in Hirschsprung's disease is not usually a satisfactory procedure. Operations on the cervical sympathetics in certain cases of angina have been satisfactory. The removal of the adventitia of large arteries for pain due to ischemia in the extremities is more uncertain but frequently seems to bring relief.

These few examples may give some conception of the debt that modern surgery owes to physiology. Physiology has also benefited by the careful study of clinical cases which always offers a fruitful field for research.

References

Swift, Homer F.: The Art and Science of Medicine, Science **68**: 167, 1928.

Evans, Charles Arthur Lovatt: The Relation of Physiology to Other Sciences, Science **68**: 259, 1928.

Ivy, A. C., and Farrell, J. I.: Am. J. Physiol. **74**: 3, 1925.

Black, Donald R.: Achlorhydria, Southern M. J. **21**: 920-924, 1928.

Hughson, Walter: Reflex Spasm of the Pylorus and Its Relation to Diseases of the Digestive Organs, Arch. Surg. **11**: 136, 1925.

Olch, I. Y., and Elman, Robert: Regurgitation of Duodenal Contents as Factors in Neutralization of Gastric Acidity, Proc. Soc. Exper. Biol. & Med. **25**: 184, 1927.

Alvarez, Walter C.: The Mechanics of the Digestive Tract, New York, Ed. II, 1928, Paul B. Hoeber Co.

Osborne, T. B., and Mendel, L. B.: The Incidence of Phosphatic Urinary Calculi in Rats Fed on Experimental Rations, J. A. M. A. **69**: 32, 1917.

Fujimaki, Y.: Formation of Urinary and Bile Duct Calculi in Animals Fed on Experimental Rations, Progress of the Science of

Nutrition in Japan, League of Nations Health Organization, Geneva, 1926, p. 369. (From J. A. M. A., editorial 88: 1080, 1927.)

Robinson, William L.: Some Fundamental Characteristics of the Spleen and Their Relation to Function, Ann. Surg. 88: 333, 1928.

Andrews, Edmund, and Reuterskiold, Knute: Dangers in the Postoperative Use of Insulin, Surg. Gynec. & Obst. 47: 665, 1928.

Fisher, D., and Snell, F.: The Insulin Treatment of Pre- and Postoperative Nondiabetic Acidosis, J. A. M. A. 82: 669, 1927.

Thalhimer, W.: Insulin Treatment of Postoperative (Nondiabetic) Acidosis, J. A. M. A. 81: 383, 1923.

Ort, M.: Treatment of Postoperative Acidosis by Means of Insulin, Arch. Franco-Belges de Chir. 27: 994, 1924.

Irwin, E. L.: Insulin in Treatment of Undiabetic Acidosis, New Orleans M. & S. J. 77: 379, 1925.

Haden, R. L., and Orr, Thos. G.: Use of Sodium Chloride in Treatment of Intestinal Obstruction, J. A. M. A. 82: 1515, 1924.

CHAPTER IV

THE IDEALS OF THE SURGEON*

MUCH has been written in recent years about the training of a surgeon. His premedical studies, his work at the medical school, his years of apprenticeship, have been fully discussed. His course has been made long and arduous. It is easy for those who have arrived to prescribe difficult conditions for those who have not.

Very little has been said, however, about the life of the surgeon, what are his innermost thoughts, what are his ambitions and his daily accomplishments. We should not lose sight of the fact that what really counts in life is not how a man started, but how he finished. The end-result is the product of his professional and his personal career. A splendid training imposes great obligations, but if it brings merely the smug satisfaction of a superior beginning, the training has failed.

"As a man thinketh, so is he." His constant thoughts, his earnest desires, constitute his ideal. I believe it was Disraeli who said that religion is not a thing to be discussed among gentlemen. A man's true ideals are more intimate than his religion, but it is only a very false modesty that would

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prohibit a full consideration of the guiding star of a surgeon's career.

In common with all inhabitants of a free country, the surgeon is supposed to have inalienable and constitutional rights to life, liberty and the pursuit of happiness. The pursuit of happiness is a very unfortunate phrase, for real happiness, when deliberately pursued, is never overtaken. It must come as an incident to a full life. Animal pleasures and gratifications that bring temporary pleasant sensations do not constitute real happiness. Ideas of happiness can be debased or cultivated, like a conscience. True happiness is within us and does not depend upon externals. It is always connected with a sense of service. It is difficult at first glance to associate a surgeon's life with happiness. Is there any greater depth of agony than sometimes comes to the conscientious surgeon when he realizes that his patient is dying because of his failure to grasp the significance of some feature of the case, or because of his neglect to perform properly some step of the operation? He would give anything for the opportunity to do this over again, but the opportunity has gone forever. His only consolation, pitiful though it be, is that he has learned something by his mistake and he can do better the next time. The inward satisfaction, however, when a desperately ill patient recovers, when skill or wisdom learned from past failures results

in new success, will bring a serene happiness that compensates to some extent for the cup of bitterness.

Happiness, then, being an incident, cannot be included in the surgeon's ideals, but results from approximation to high ideals. The words "high ideals" seem to belong together, just as we speak of a "bad cold." But though all "colds" may be "bad," there is many an "ideal" that is not "high," and if easily attained it is usually because it is too low. As they shape one's life, we can only know a man's ideals by an analysis of his life after it has been completed. Applying this test, it is remarkable to see that the things one is striving for in one's own life seem trivial, or even undesirable, when viewed historically in the life of some one else. How should we wish our lives to be known by posterity? Would a surgeon desire his survivors to think of him chiefly because he had accumulated riches during the practice of his profession? Would he care to be known as an artful politician? Would a posthumous reputation as one who had great influence and used it despotically appeal to him? Would he wish to be considered a man who desired "to seem" rather than "to be"—to pretend to great learning and skill and practice, which he knew he did not possess? While the surgeon is living, many of these things seem desirable and prove great temptations to him, but how hollow and worthless

they appear in a life that is spent! We cannot, following the proverbial deathbed repentance, indulge in these temptations and expect to reform and live a better life after we have accomplished this immediate goal. The habit becomes inexorably woven as an integral part of character.

The surgeon who has what Rowntree calls a "lust for truth," not some time in the future, but now and here, who makes an earnest effort to go to the bottom of every case, who tries to the best of his ability "to do justly, and to love mercy, and to walk humbly"—such a surgeon has the highest of all ideals. He will not fully attain his ideal, but if in season and out of season, through good report and bad report, he ponders on his ideal and struggles after it, his life will be a satisfaction to himself, an inspiration to his colleagues, and a benediction to his country.

Let us see how some of these abstract idealistic things can be translated into terms of the busy, everyday life of the surgeon. First of all, he can constantly learn from his cases to improve not only his technic, but his methods of diagnosis and interpretation of what he finds before, during and after operation. The biologic processes that follow every operation are intensely instructive. If the patient dies, a necropsy should be obtained, particularly if the cause of death is not obvious. Our failures are our greatest assets if we will only face them

squarely and study them carefully. A surgeon can usually secure a postmortem examination if he earnestly desires it. A tactful and prompt approach to the relatives with an explanation that no unnecessary mutilation will be done, that other members of the family may have the same disease and that an accurate knowledge of the cause of death will increase the surgeon's usefulness to his patients, rarely fails to secure the necessary permission. But the surgeon must be prepared to acknowledge his errors if the necropsy shows them, however mortifying they may seem. Many deaths that might have passed as heart failure, shock, or asthenia will be found at necropsy to be due, as Dr. W. J. Mayo says, to very real things, and it is the surgeon's duty to see that "these dead have not died in vain."

The surgeon should study pathology. He may or may not be his own pathologist. If he has a large practice and has access to a pathologist, he should at least examine carfully the gross specimen he removes at operation and ask the pathologist to demonstrate to him the microscopic section of every tumor he operates upon. He should always have time for this, even if he must do less operating in order to give more attention to pathology. The relationship of physiology and pathology to surgery cannot be too intimate. What can be more interesting for a surgeon with scientific curiosity

than to view the histology of an unusual tumor that he has just removed? Who can doubt that one who studies the tumor he removes and who has a mental image of its gross and histologic structure is, other things being equal, more competent to deal with tumors than the surgeon who leaves this for some one else to do? Dr. T. S. Cullen has spoken of the lack of interest in pathology as the weak spot in American surgery. Pathology is a very vital spot and gives a leaning to the scientific side of surgery and an added interest in underlying principles that mere dexterity in mechanical technic can never bring. It tends to keep the surgeon from being merely a "cutter."

The ideal of the surgeon's relation to his patient is obvious from what has been already said. Unless he strives "to do justly, and to love mercy, and to walk humbly" by his patients, as well as his fellow man, his skill and learning are as sounding brass or tinkling cymbal. Efficiency without character is a poor staff to lean upon. But "to do justly," I think with Dr. Richard Cabot, that every surgeon or physician should tell his patient the truth. It is not necessary to ram brutal facts into an unwilling patient, but if the patient is told anything, it should be the truth. This subject should be viewed from several different points. Telling an untruth injures the character of the one who tells it. It is doubtful whether the color scheme of lies, classify-

ing some as "white lies" and others as "black lies," with intermediate shades, has any justification. Most patients, as a matter of fact, find out sooner or later that they have been deceived. A woman who has cancer of the breast and who is told by a surgeon, at the request of the patient's daughter, that she has no malignant disease will eventually learn the truth. If the cancer is inoperable her death results in a few months and the remainder of her life will be in a "fool's paradise" until at its later stages when the facts force themselves upon her. Besides, if the daughter afterwards develops a breast tumor, she will probably not believe what the surgeon tells her. As a rule, even though the patient may apparently be nervous, the truth tactfully told has much less upsetting effect than is generally supposed, for the patient knows the situation at its worst and has a faith and confidence in the surgeon that would otherwise be impossible. Cooperation then is always more satisfactory.

The effect on society of making a practice of deceiving a patient is sometimes farreaching. Doctors often complain that the public has but little confidence in them. If a doctor deliberately deceives a patient, he cannot expect any more confidence than would be given to a chiropractor or an osteopath. There is little to choose between honest ignorance and knowledge combined with a deliberate intention to deceive. There is no operation or treat-

ment so complicated that the patient, if of average intelligence, cannot understand its essentials if the surgeon knows the subject well and has the ability to explain it. Frankly telling the patient and the relatives of the patient the main points in the diagnosis, the operation and the after-treatment, thus treating them as rational human beings instead of as irresponsible children, is an important measure in establishing the confidence of the public.

The ideals of a surgeon in regard to medical and surgical societies should be such as duty seems to dictate. He should, of course, be a member of his county society and of his state medical society, of the American Medical Association, and, if in its territory, of the Southern Medical Association. He should contribute in every way he can to the elevation of the profession to which he belongs. He should love, cherish and nurture it. His thoughts and ideals should be so fixed on doing his best that his own conscience can commend him, and he will then possess no overweaning ambition to have his life work tagged by some individual or some society. To desire the approval of others whose opinion one respects is natural and proper, but membership in special societies or honors conferred by being made an officer in any medical or surgical association should come largely, if not entirely, as a result of worthy professional work. If they do not come in this way, they do not mean anything. If a "friend

at court'' is necessary for a deserving surgeon to gain membership in a special society, such membership ceases to be attractive. If honors in any surgical or medical society are obtained only by resorting to political tricks, they become veritable Dead Sea fruit. Medical or surgical associations whose chief object is to elevate medicine or surgery should, of course, be encouraged by all proper means, but there is the serious practical objection to this type of society that the very surgeons whom the originators intended to suppress are most keenly desirous of being members in order thereby to have their somewhat dubious careers stamped with approval. Being, as a rule, excellent politicians, this type of men may gain control, and then the society merely serves to protect the very thing it was created to abolish. We cannot create morals by force. Unless a surgeon has high ideals, merely keeping within the law does not make him a source of pride to his profession. His ideals must be high because of the inward joy and satisfaction they give and not from the fear of punitive measures or from the hope of ostentatious rewards. True happiness, like the kingdom of heaven, is within us.

Finally, having chosen his ideal, the surgeon should constantly strive to attain it. It is impressive to see a character deteriorating. A surgeon who may have native ability may also have a turn for politics, or may be somewhat lazy and lack

tenacity of purpose. He finds that being a good mixer pays, and he cultivates this talent, resolving that after a while he will be more earnest in his professional work. But he gives up more and more to his political talent and finally middle age creeps upon him. He may have been elected president of every society of which he is a member, but his chief concern has become medical politics, not scientific surgery. Or laziness, jealousy, carelessness may be the besetting sins which, when not suppressed, strangle what might have been a fine character. There is no more striking tragedy than this. There is no greater waster of time or consumer of energy than hatred, vengeance, a desire "to get even" for a real or fancied wrong. But if the surgeon's ideals are high and he manfully tries to attain them, these vices are kept under increasingly better control. It is a solemn thought that we do not stand still in building our characters. We are making either for better or for worse.

If a surgeon has but approximated these ideals, his career will be a life of satisfactory accomplishments, a noble example of citizenship, a true inspiration to his colleagues, and at the end he will

> "Join the choir invisible
> Of those immortal dead, who live again
> In minds made better by their presence."

CHAPTER V

THE CAREER OF A SURGEON*

EACH surgeon has, to a large extent, the power to fashion his career after his own liking. John Oxenham has beautifully expressed such an idea in his poem, "The Ways:"

> To every man there openeth
> A Way, and Ways, and a Way,
> And the High Soul climbs the High Way
> And the Low Soul gropes the Low,
> And in between, on the misty flats,
> The rest drift to and fro.
> But to every man there openeth
> A High Way, and a Low.
> And every man decideth
> The Way his soul shall go.

Which of the numerous Ways does the surgeon elect to follow? His choice with persistence of effort very definitely fixes his career. Down in the bottom of his heart does he desire the limelight more than anything else? Is it his wish to have the conspicuousness and power that accrue to the holders of offices in medical societies? Is he attracted by the exclusiveness of membership in certain surgical associations? Does he mistake the chaff for the wheat? An office filled because of good professional

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or scientific work or because of faithful and worthy service to the association is a badge of merit, but when obtained like kisses by favor, because of political pull or friendship and influence with the powers that be, the office becomes only a token of political efficiency and ceases to be desirable. The chief glory of the Southern Medical Association is its freedom from politics, which is too often a blight on scientific progress.

A surgical career can only be truly satisfactory to one who is interested in the science as well as in the art of surgery. The acquiring of the technic of an operation and the possession of manual dexterity, necessary to its performance, are essential; but an intimate acquaintance with the anatomy, physiology and pathology of the tissues involved in the operation are just as important as the carrying out of a mechanical technic. A knowledge of physiology and of the biologic processes that go with tissue repair is peculiarly important in operations on the gastrointestinal tract, the brain, the lungs, and the urinary system. A practical acquaintance with pathology is a great aid in the treatment of tumors, inflammatory and bacterial affections, and proves a scientific stimulus throughout the surgeon's career. A patient may die from an improperly placed intestinal suture or from a poorly tied ligature, or death may follow an incision, ignorantly made, into a malignant tumor which produces

metastases. Death from the former cause is more dramatic and spectacular than from a careless incision into a cancerous growth that is supposed to be benign, but the patient is equally dead from either mistake, and one catastrophe is just as great as the other.

With an interest in pathology goes the desire for postmortem examinations in all patients who die, except possibly in those whose deaths are due to obvious causes. This is not merely scientific curiosity but has great practical bearing. I can recall a number of cases in my experience in which the necropsy disclosed an unexpected cause of death and the knowledge thus obtained was subsequently most helpful in treating other patients suffering from the same disease. Surgeons who do not have necropsies of at least most of their operative deaths are greatly to be pitied. They are missing a wonderful opportunity of increasing their knowledge and efficiency.

The career of a surgeon who is merely an operator—a "cutter"—is of very doubtful benefit to himself or to humanity. A certain degree of manual skill is essential to good results, though a surgeon who is not imbued with a knowledge of biologic principles, who is not particularly interested in pathology but becomes intoxicated with his own dexterity, may be a source of very real danger. His efforts to have things appear to the spectators to

run smoothly, his endeavor to finish the operation in the fewest possible number of minutes and to leave the sutures in mathematical regularity are commendable only if he has not thereby sacrificed the principles of gentleness in handling tissue, of complete hemostasis, of removal of the pathologic conditions and of doing what he truly thinks is best for his patient.

Nothing is more helpful and stimulating to a surgeon than to have some research problem in mind. It may be a simple problem, only the checking up or the amplifying of some other person's results; it may be merely trying out different types of ligatures or sutures and their applications in the lower animals. But if the surgeon acquires the habit of looking for such problems they are more readily seen. Many of the greatest discoveries in surgery were made by the country doctor, such as the operation on vesicovaginal fistula, the discovery of the application of the silver wire suture by Sims, and the operation of ovariotomy of Ephraim McDowell. Who shall deny the possibility of discoveries by the isolated surgeon in these modern days as long as an active scientific curiosity is encouraged and the will to get at the bottom of things exists? The word "research" often has too formidable a sound and discourages an humble undertaking that might be of distinct value.

The keeping of accurate histories and pathologic

reports helps wonderfully in bringing out new facts. A small group of cancer cases accurately studied and carefully traced is of more value than a much larger number in which many of the patients cannot be followed after discharge from the hospital. A matching of the gross and histologic appearances of a tumor with the type of treatment and the end-results is always informing. The observation of the character and distribution of pain in certain diseases, the relation of the blood count and blood chemistry to some abdominal lesions, the devising of methods of applying physiologic rest in injured tissues, the adaptation of surgical technic to subsequent function—these are but a few suggestive fields in which it is possible for a well-trained surgeon to uncover new things.

Universities and great clinics are extremely valuable for the training of a surgeon. Nothing is more inspiring than a great teacher—one in whom passion for truth and an enthusiasm for importing it burn fiercely. But after learning laboratory and clinical methods, the surgeon must deal directly with the diagnosis of cases and the treatment of patients. His power of observation and of thoughtful study of each case should be exercised on all occasions, for he will find unexpected conditions and interesting phases arising in some case as long as he practices surgery, if he will only keep his eyes open for them. The rarest of conditions may be

just around the corner for any surgeon. An apparently plain case of acute appendicitis may prove to be an inflamed diverticulum of the cecum, as has happened in my experience. What seems an obvious cholecystitis may show carcinoma. The necessity of dealing with such unexpected conditions often calls for the wisest judgment and brings forth the mettle of the surgeon. The method of dealing with each case should be mentally reviewed when the case has been completed and an honest conclusion reached whether the best thing was done in this particular instance. A summation of these experiences, which continue throughout his career, go to make the education of the surgeon, and though, like Henry Adams, he may never be truly educated, he will at least increase in knowledge and efficiency.

And such experiences, when courageously faced and honestly pondered, do more than merely add to the efficiency of the surgeon's work. They make character. No one should be permitted to embark on a surgical career unless he is first of all a good citizen, unless he stands for what is best in his community, unless he has a keen sense of right and wrong and the courage of his convictions to do what is right, unless he has a human touch. But on these elemental virtues to begin with, surgical experiences are great character builders. They are dealings with nature, and nature's laws must be recognized and followed. The bitterness of disappointment at

the death of a patient, the chagrin at a mistaken diagnosis, the mortification of an unexpected wound infection, are at least partly offset by what is learned and by the knowledge that the surgeon is better prepared to meet similar conditions in the future. The joy of success is obvious and need not be mentioned, except to remember that we should walk humbly, even with success. Can any one doubt that these things make character and so increase the value of the individual to his community and to his country?

The necessity for intelligence, for preliminary education, and for adequate training of a surgeon are constantly emphasized. The foundation upon which his career should firmly rest is intelligence, training and character—these three, and the greatest of these is character.

CHAPTER VI

SHALL SURGEONS TELL THE TRUTH?*

AMONG the many puzzling problems that surgeons often face is what to tell the patient. This apparently simple problem looms large. It is particularly prominent in cases of cancer. The confusion of the public as to whether a doctor will tell the truth about a case is often made worse by the divergent views of the members of the medical profession. Thus, a prominent neurologist of New York in an article in *Harper's Magazine* a few months ago, entitled "Shall Doctors Tell the Truth?" maintained the thesis that there were many instances in which doctors should deliberately deceive their patients. On the other hand, Dr. Richard C. Cabot many years ago conducted an investigation as to the wisdom of accurately informing patients about their diseases and concluded that solely from a clinical viewpoint patients who were told the facts seemed to do better than those who were deceived. This work of Cabot, however, is but little known, and an unfortunate situation seems to have arisen in which, according to public opinion, surgeons and physicians find it necessary to have a special lying license in order to carry on their work.

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In cancer this problem often arises: A patient with a suspicious lump in her breast will be accompanied by a daughter who in a private interview requests the surgeon not to tell her mother that the mother has cancer because the daughter is certain that the patient will be greatly affected if she knows the diagnosis. If such a policy of deception is deliberately pursued, the patient sooner or later will doubtless know the facts, particularly if there is a recurrence. There can be no real cooperation as to the operation and the after-treatment, and, even worse, the daughter will unconsciously lose respect for the surgeon and for his veracity. If the daughter in the future has a lump in her breast and goes to the same surgeon and he tells her that it is a benign growth, she may be too polite to say so, but she will think, "The surgeon deceived my mother; how am I to know whether he is telling me the truth?" Thus an increasing distrust of surgeons and of the medical profession generally is bred, while we sorely need public confidence in order to carry on research work, to diminish cancer and heart diseases, and to wipe out contagious affections.

How can we expect an intelligent public to cooperate wholeheartedly with a profession that deliberately lies to the patient? Surely it is unnecessary to pour brutal truths in the patient's ear, and if the patient's relatives or friends request that a dis-

agreeable diagnosis be withheld, the surgeon should respect such a request. The surgeon, too, should put as optimistic an outlook on any clinical situation as the facts will justify. But all this is quite different from deliberately adopting the policy of telling the patient that he or she has no malignant disease when the surgeon is positive that the patient has cancer.

The very basis of scientific work is a search for truth, and surgeons in the operating room and in the laboratory cannot consistently pursue the search for truth, while in their private practices they are suppressing it. Such a policy is not only inconsistent and generally demoralizing but also is to a large extent responsible for much of the distrust of physicians and surgeons that is now only too prevalent. Usually the surgeon can explain to an intelligent patient the general outlines of the diagnosis and treatment to be followed, and if the results are not entirely as expected, a frank disclosure of the reasons should be acceptable to any intelligent layman. We owe it not only to the public but also to ourselves to adopt some policy of informing the patient—a policy which will be worthy of the fullest confidence of the public and which at the same time cannot tend to weaken our own regard for truth.

CHAPTER VII

STOMACH TROUBLE*

HEADACHE, backache and stomach trouble make up a large proportion of human miseries. In this group stomach trouble looms large. Most diseases that are serious and many trivial affections are accompanied by some stomach symptoms. Stomach trouble may develop from a tumor of the brain or an infection of the foot. In the symptomatology of practically all the acute infectious diseases one of the first symptoms is anorexia, nausea and vomiting. Toxic conditions of all kinds may cause anorexia or nausea. Psychic shock or worry, trauma and improper diet are common causes of stomach trouble. These causes usually produce symptoms without gastric lesions. Organic affections of the stomach, such as ulcer or cancer, give rise to stomach trouble, though occasionally they exist for a long time without any gastric symptoms.

In such a chaotic and confused aggregation of causes for so common a complaint, it is natural to expect there will be divers and sundry remedies, many of them empirical and many of them inefficient. Much of this confusion, however, can be clari-

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fied by a study of the physiology of the stomach. It is impossible to have a proper conception of the abnormal workings of an organ or a machine without an understanding of the normal function. No one would undertake to diagnose or treat an imperfectly running motor without knowing how it acted when things were going well. And yet in treating stomach trouble too frequently empirical remedies are administered without any consideration of the normal action of the gastrointestinal tract. Numerous diets are exploited, ranging from raw eggs to sauerkraut. Cultish methods of regulating diet, in which mastication must be carried out in a definite manner and time, or in which certain classes of food must either be adopted or avoided just on general principles, have their peculiar advocates. Occasionally these methods succeed, which makes their adherents all the more enthusiastic. The same thing is true of cults in general. If an automobile mechanic would insist upon regulating the carburetor for every trouble of a motor, it is, of course, conceivable that in some instances his adjustments would correct the trouble; but when a spark plug is dirty or a cylinder cracked, or the distributor is broken, the carburetor adjustment would be of no avail. So, in treating stomach troubles, various phases of this complaint can be properly comprehended only with a conception of normal function. A study of function necessarily implies a knowledge

of structure; so we will briefly review the embryology and structure of the stomach in order that we may clearly discuss function.

Embryology

The stomach first appears as a laterally flattened fusiform enlargement of the foregut in embryos, 4 to 5 mm. in length. As this enlargement descends the digestive tube above, it is elongated, forming the esophagus. This appears about the fourth week. A short distance distal to the primitive stomach, the foregut opens freely into the yolk sac. This opening at first is wide but later is narrowed into a small tube called the yolk stalk or vitelline duct. The allantoic duct arises from the caudal, or blind, end. As the development proceeds, the stomach dilates locally to form the fundus, and the subsequent greater growth dorsally forms the dorsal greater curvature. At this time the stomach faces right and left. The intestinal tube is lengthened, and the attachment of the mesoderm dorsally is drawn out and forms a common mesentery which is along the greater curvature of the stomach and lies dorsally.

The greater curvature of the stomach develops much more rapidly than the lesser curvature, and gives the characteristic appearance to the stomach. The stomach rotates and the vagus nerve is carried with it, so that the left vagus is on the ventral surface of the stomach and the right is posterior. Dur-

ing the second month the epithelial growth almost occludes the esophagus, but at the end of this time vacuoles appear among the epithelial cells and serve to enlarge the lumen. Persistence of this constricted condition in the embryonic esophagus produces congenital esophageal stenosis.

During the sixth month the cecum normally descends into the right iliac fossa, and the intestines are elongated. The proximal part of the yolk sac or vitelline duct disappears during fetal life. Occasionally it persists and forms a sac known as Meckel's diverticulum.

Anatomy

The outlines of the stomach are changeable, and depend not only upon the individual but also upon the position of the body and upon the contents of the stomach. For these reasons it has been difficult for different observers to fix upon the anatomic divisions of the stomach. For purposes of anatomy, the outline by Cannon, or some slight modification of it, is usually found satisfactory. (Fig. 1.) This divides the stomach by the notch at the lesser curvature, the incisura angularis, or reentrant angle, and a line is drawn from this point to a point opposite it on the greater curvature. To the right of this line is the pyloric portion, and to the left is the cardiac portion. The part above a horizontal line through the cardiac orifice is the fundus. Between

the fundus and the incisura angularis is the body of the stomach, or the pars media. The pyloric portion of the stomach is divided by some observers into three parts, and by others into two. The portion of the stomach, about 3 cm. long, which termi-

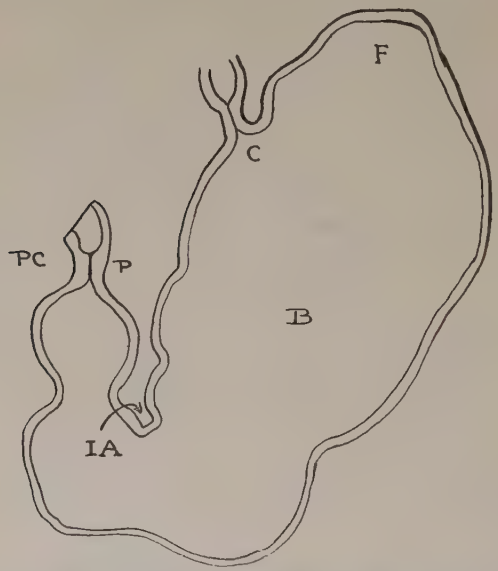

Fig. 1.—Schematic outline of stomach (Cannon). C, cardia; F, fundus; IA, incisura angularis; B, body; PC, pyloric canal; P, pylorus; IA to PC, antrum. The pyloric canal is about 3 cm. in length and very muscular.

nates in the pyloric sphincter, is the pyloric canal, and that portion between the pyloric canal and the incisura angularis is the pyloric antrum. The antrum is sometimes subdivided into the antrum and the vestibule, but this seems unnecessary.

The stomach has three layers of muscle. The outer layer is the longitudinal, and is a continuation of the longitudinal muscle of the esophagus. This coat forms a narrow and powerful band of muscles along the lesser curvature, and a broader but feebler band along the greater curvature. The bundle along the lesser curvature spreads out in the pyloric region and becomes thinner at this point. The middle or circular layer is arranged in circular bands which cover the stomach with the possible exception of the fundus. This layer is directly connected with the circular muscular coat of the esophagus and of the duodenum. It is particularly powerful at the pylorus and serves to form the aggregation of muscle making the pyloric sphincter. The transition of these circular fibers to those of the duodenum is sudden, though the connection is plain. The third and deepest layer of muscle fibers is the oblique layer. Upon the anterior and posterior borders of the stomach these oblique fibers diverge, and along the lesser curvature they run parallel.

The mucous membrane is separated from the muscle of the stomach by the submucosa, which supports the blood vessels and lymphatics and Meissner's plexus that is distributed to the mucosa. The larger plexus, or the myenteric plexus, of nerves is between the longitudinal and circular muscular coats. The blood vessels in the pyloric portion of

the stomach and in the first part of the duodenum have a peculiarly long course, which predisposes to thrombosis. In the cardiac portion of the stomach the gastric glands are long and tubular, and contain chief cells and parietal cells. The chief cells are called central or peptic cells and secrete pepsinogen which makes pepsin. The parietal cells are responsible for the hydrochloric acid, though it is probable that they do not secrete acid as such but as ammonium chloride. The pyloric glands secrete no acid or pepsin, but a clear material which is alkaline in reaction. It is important to know this. Brunner's glands penetrate into the mucosa of the pyloric end of the stomach for some distance.

The extrinsic nerve supply of the stomach is from the vagus and the sympathetic. The vagus was formerly supposed to carry all the motor impulses and the sympathetic the inhibitory. As a matter of fact, the vagus is a bundle consisting of a number of fibers of different types, and while many fibers that conduct motor impulses are undoubtedly contained in the vagus, some that carry inhibitory impulses are found there also. The sympathetic likewise carries some motor fibers in addition to its fibers for inhibitory impulses.

Physiology

There is probably no absorption of food or water from the stomach. Highly concentrated sugars may be taken up to some extent. Alcohol and drugs are

freely absorbed from the mucosa. Food in the stomach at first retards peristalsis. During this time the ptyalin from the saliva may continue to act upon the starches until the medium becomes well mixed with the acid gastric juice and is acid in reaction. Pytalin acts in both an alkaline and a neutral medium. Peristalsis seems to begin about the middle of the body of the stomach, and proceeds with increasing vigor toward the pylorus, while the fundus and the adjoining cardiac portion are in tonic contraction. Cole has shown that there are one, two, three or four cycles in the gastric peristalsis, and that most stomachs empty on the four-cycle arrangement—that is, four different waves can be noted at the same time. There is a period of contraction, or a systole, and a period of relaxation, diastole. The systole occupies seven-tenths of the time of the cycle, which is two to three seconds. Not all of the waves that originate in the body of the stomach reach the pylorus. Klein has shown that some of them only go so far as the pyloric antrum, and also that others apparently originate about the pyloric antrum and proceed toward the pylorus. Klein has also noted that solid material impacted in the pyloric antrum reverses peristalsis.

The mechanism of the emptying of the pyloric sphincter is interesting. Formerly it was thought by Pavlov and Cannon that the pyloric sphincter emptied largely by chemical control. When the con-

tents of the stomach became very acid the pyloric sphincter relaxed, and when the contents of the duodenum became slightly acid it contracted. It is true that contraction of the pyloric sphincter can be initiated by placing a strong acid on the duodenal mucosa, but this doubtless only acts as an irritant because mechanical trauma of the duodenal mucosa will have some effect. Besides, if excessive acid in the stomach were necessary for the pylorus to open, in cases of achylia the pylorus would never relax. According to Cole, Luckhardt and others, the pyloric sphincter probably relaxes somewhat with each strong gastric peristaltic wave that reaches it.

Alvarez in the last few years has shown that peristalsis is to a large extent myogenic in origin. While the external nerve supply has much to do with conducting reflexes from a distance, the routine work appears to originate in the muscle in peristalsis of the stomach and intestines, somewhat as it does in the heart. The lesser curvature, as has been noted in the embryologic development, is the original, practically unchanged, portion of the gastrointestinal tract. The greater curvature is the portion that has bulged out and become distorted. Alvarez has shown that if a strip of muscle is taken from the lesser curvature near the esophagus and placed in oxygenated Locke's solution, it will have a rhythmical contraction of eleven per minute, whereas a strip taken from near the pylorus on the

greater curvature will contract at the rate of two per minute. Similarly, a strip from the duodenum will contract about twenty times a minute, whereas in the terminal ileum the rate of contraction is only about ten times per minute. In this way peristalsis results from what he terms gradients, and from the most sensitive and active portion the movement is initiated. During gastric peristalsis the cardiac portion of the stomach is in tonic contraction and acts as a rubber bag forcing food into the pyloric portion where peristalsis is active.

Eugene Klein, of New York, has confirmed Alvarez' work. He thinks that portions of the lesser curvature near the esophagus and also near the incisura are centers somewhat like the sino-auricular node of the heart and that the impulse for peristalsis is initiated there and peristalsis begins as ripples unobservable roentgenographically until the more pronounced contraction appears about the middle of the body of the stomach. He has called attention to the fact that an ulcer along the lesser curvature will produce spasm of the corresponding segment of the stomach, whereas an ulcer on the greater curvature may cause practically no spasm or symptoms. Experiments in which the lesser curvature has been injured or removed have shown that there is marked interference with the emptying of the stomach, but if the stomach of an animal is divided almost down to the lesser curva-

ture and the lesser curvature left intact with even a small opening, little or no interference with the emptying occurs.

The theory of Edkins that there is a specific hormone secreted by the pyloric mucosa of the stomach which is absorbed and stimulates gastric juice has not been proved. There are many substances which, injected into the blood, will cause a secretion of gastric juice, such as extract of strawberry, meat extracts and extracts of spinach.

Carlson has stated that there is no such thing as hyperacidity—that the variation is chiefly downward, beginning with one-half of one per cent hydrochloric acid. He thinks that the gastric juice has been too much glorified, and in a study of gastric function in three individuals in whom there was a gastrostomy because of cicatricial esophageal stenosis he was able to draw out the so-called appetite gastric juice and digestion would proceed fairly satisfactorily. Ivy in more recent work has elaborated the causes of gastric secretion. Pavlov has demonstrated the appetite gastric juice which comes from the sight or smell of food and from the sensation produced by food in the mouth. Later, the presence of food in the stomach causes gastric juice to appear. This is not solely mechanical, because inert substances, such as sand, applied to the gastric mucosa, produce no gastric juice, but cause mucus. The exact stimulus in food for gastric juice

is not clearly understood, but meat extracts and bread in which there is a certain amount of protein undoubtedly stimulate gastric juice markedly. Ivy has shown that some substance stimulating the secretion of gastric juice is absorbed in the blood during digestion. A spastic pylorus or mechanical obstruction which delays the emptying of the stomach and prolongs the contact of food with the gastric mucosa will cause an increase of gastric juice and produce an apparent hyperchlorhydria, which is really due to the normal reaction of the stomach to the prolonged contact of food. Measures that without irritation tend to empty the stomach more readily will lessen the amount of gastric juice.

The chief action of the gastric juice is on proteins, which it converts first into acid albumin or syntonin, then into primary and secondary proteoses and finally into peptones, and this process is continued still further to amino acids in the small intestine. Fats and starches are practically not acted upon at all in the stomach. Proteins, then, not only call for gastric juice but they also stimulate peristalsis.

The acidity of the gastric juice varies not only with the individual, but also in the same individual from time to time. The hydrochloric acid and the pepsin in gastric juice are more concentrated when secretion is rapid during the process of digestion. The presence of a high degree of hydrochloric acid,

or so-called hyperchlorhydria, is not necessarily a forerunner of ulcer. Dragstedt produced in dogs in which there was a low hydrochloric acid content in the gastric juice an artificial peptic ulcer, and found the hydrochloric acid content was elevated. We know that in other regions the presence of an irritant often tends to increase the secretion, so it seems more probable that if there is any relation between high hydrochloric acid content and ulcer, it is one in which the ulcer is the cause and the high hydrochloric acid the effect.

Derangements of Gastric Function

Probably the most common of the serious deficiencies in the secretion of gastric juice is the lack of acid, or achylia gastrica. This may be from various causes, some of which are not thoroughly understood. Many cases of achylia gastrica are doubtless due to some toxic substance that affects the glands of the stomach and so diminishes secretion. For example, in pernicious anemia achylia is an early and constant symptom. Cancer in any portion of the body elaborates a toxic material which often causes achylia gastrica. This is particularly true of cancer of the stomach, possibly because of the proximity of the malignancy and consequently greater opportunity for the gastric glands to be affected. There is nothing pathognomonic, as is sometimes supposed, in the lack of acid in the gastric juice in carcinoma of the stomach, because

this condition occurs from carcinoma elsewhere. Whether the cause can be definitely ascertained or not, the administration of large quantities of dilute hydrochloric acid, about 1 dram in water or milk three times a day, may be beneficial.

At least 80 per cent of stomach troubles are due to interference with the motor mechanism, and not from affections of secretion. The stomach has a sensory nerve supply which is small, and the sensory fibers terminate in the muscle and do not reach the mucosa. When there is a lesion, as an ulcer in the pylorus, the accompanying congestion sensitizes the nerve fibers and makes them more liable to initiate impulses of pain, just as hyperemia on the hand around a boil would make the nerve fibers supersensitive. Consequently, contraction or spasm which under ordinary conditions would cause no discomfort may give rise to pain when there is hyperemia from an ulcer. Then, too, Cannon, Carlson and others have shown that hunger pains which are synonymous with intense contraction of the stomach may be produced by prolonged fasting.

The theory of Alvarez, of the myogenic origin of peristalsis, which has been confirmed by Klein, holds for most of the actions of the stomach, because the extrinsic gastric nerves of dogs can be severed, and while peristalsis will be markedly interfered with for a few days, it will eventually pro-

ceed almost normally; this does not mean, however, that the external gastric nerve supply is unnecessary. Many reflexes are produced through these nerves. Roentgenologists have noted the ileocolic reflex, by which when the lower ileum empties into the cecum the pyloric sphincter relaxes almost immediately. But the work of Alvarez has served to give a logical explanation for many phenomena of stomach trouble which heretofore could not be explained. He has shown, among other things, that the sensitive muscle of the gastrointestinal tract where peristalsis is initiated and where the rate of contraction is high, is more affected by toxic influences than is the more slowly contracting muscle. In dogs or cats with influenza he has found that the muscle in the lesser curvature near the esophagus contracts more slowly than normal, whereas muscle near the pylorus may be but slightly affected. When strips of the highly active muscle from the lesser curvature and strips of slowly acting muscle from the greater curvature are placed in oxygenated Locke's solution, both contracting at their respectively proper rates, it will be found that the rapidly contracting muscle will be slowed down by the gradual reduction of oxygen in Locke's solution before the slowly contracting muscle is affected. The former is not only more sensitive but also less hardy.

Interpretation of Symptoms

With these physiologic facts before us, much can be explained that was formerly but poorly understood. We can see how acute infectious diseases, such as measles, pneumonia, and diphtheria, will cause nausea and possibly vomiting because toxins decrease the function of the sensitive muscle along the lesser curvature near the esophagus where peristalsis is initiated, whereas the slower and more hardy muscle is but little affected. In this way, the mechanism or peristalsis is upset, and it may be that there is sufficient change to produce an actual reversal of peristalsis. Thus, there may be anorexia and nausea, and possibly vomiting.

We know, too, that pylorospasm is affected reflexly and that the impulses are carried largely through the vagus nerve. Acute appendicitis creates impulses through the vagus, which tend to produce contraction of the pylorus, and the firm contraction may not only cause pain but also so elevate the muscular activity in this region as to cause vomiting.

Walter Hughson, of Johns Hopkins Hospital, has shown that in marked reflex pylorospasm caused by injury to the peritoneum, section of the vagus nerve just below the diaphragm will relieve the pylorospasm, as it breaks an arc in the reflex.

Analyzing such common complaints as biliousness, water-brash and heartburn, we can find a log-

ical explanation for them. Stomach trouble, or so-called indigestion, may be assumed to be due in a large proportion of the cases to a deranged motor mechanism. If there is irritation about the pylorus, pylorospasm and delayed emptying may occur. If there is a toxic affection of the more sensitive muscles, they may be so weakened that the gradient will not satisfactorily empty the stomach; or there may be a combination of these two factors. So-called biliousness, coated tongue and heartburn are due, according to Alvarez, to reversed peristalsis, from irritation at the pylorus or lower in the gastrointestinal tract; the cardiac sphincter is relaxed, and the gastric juice is extruded into the esophagus. It reaches the upper part of the esophagus, where there is smooth muscle fiber, and is quickly swallowed, but a bitter taste results. Alvarez has noted that in cases of heartburn almost always the contents of the esophagus are acid, where normally they would be alkaline. This is not due to any excess acid in the gastric juice, but gastric juice does not normally belong in the esophagus. In women who are pregnant, when the activity and gradient of the lower segments of the intestine are raised because of the hyperemia of pregnancy, it is a common thing to find nausea, sometimes vomiting, and decay of the back teeth from regurgitation of the gastric juice. It does not seem probable that a physiologic condition such as pregnancy should al-

ways be accompanied by nausea due to a toxemia. Toxemia is pathologic, but pregnancy is almost always accompanied at some time during the term by nausea, heartburn, and water-brash.

A coated tongue is often due to regurgitation of the gastric and duodenal contents. The mucosa of the tongue has no unusual glands and is coated either because of sepsis in the mouth or sinuses, or by regurgitation of the gastric and duodenal contents. In other words, fecal contents from the small bowel come back in case of "biliousness" (disturbed motor mechanism) and coat the back of the tongue.

Treatment

The practical application of these observations is obvious. First of all, it should be determined whether the stomach trouble is due to psychic influences, to toxic material or to a spasm. There is a possibility of improper gastric secretion causing it, but this is not great. If there is a toxic cause, such as a focus of infection, it should be treated. If the nerves are supersensitive from anxiety or from psychic influences, this should be corrected. It is well known that the secretion of bile has nothing to do with so-called biliousness. A temporarily deranged motor mechanism may sometimes be set aright by a purgative.

The administration of alkalies, and particularly of soda, often gives relief from stomach symptoms. This is primarily not because of neutralization of

the acid, but because a high acid content in the gastric juice may tend to increase peristalsis, and there may also be some indirect effect of the soda upon the muscles of the stomach. Alkalies given indefinitely, particularly in large amounts, may do much harm by irritating the stomach and by causing alkalosis. Probably calcium carbonate is the least injurious alkali to be given continuously, as it acts only in the presence of a free acid. Chewing gum may increase saliva and so decrease gastric acidity. Belladonna and its preparations often relax spasm of the pylorus and so regulate peristalsis. Administration of a purgative sometimes has an irritating effect which tends to raise the rate of contraction in the upper segments of the gastrointestinal tract, according to Alvarez, and so reestablishes the gradient.

Pure gastritis without ulcer or caustic chemical irritant is an infrequent and indefinite lesion. Some pathologists doubt if it ever occurs. Derangements of the motor mechanism are quite common. One of the best principles for treatment is the old principle of rest, emphasized by Hilton sixty-five years ago, and rest means avoiding function as far as possible. If, then, we find that proteins stimulate both the peristalsis and the secretion of the stomach, it is best to reduce the intake of proteins. Carbohydrates and fats are not at all affected by the gastric juice. By balancing the diet so that the

intake of food will be no more than is necessary to maintain life, and by giving the stomach as little work as possible, physiologic rest for the stomach is established. The protein of milk is less stimulating than meat proteins. Water has but little effect upon the stomach.

Arrangement of the diet, arrangement of work, and correction of the psychic and toxic influences so as to lessen the burden on the stomach are the main factors in the treatment of stomach trouble.

If surgery is indicated for organic gastric diseases, the object should be to remove the pathology as far as possible and to restore physiology when it can be done. Peptic ulcers in their early stages should, as a rule, be treated medically by a diet so regulated as to give the stomach as much rest as possible. This cannot be done unless the patient is in bed, because when the patient is about he requires more food and so gives more work to the stomach. If a gastric ulcer does not heal in a few months, particularly because gastric ulcers may become cancerous, a partial gastrectomy should be done and the stump of the duodenum united to the stump of the stomach along the lesser curvature. Duodenal ulcers that are refractory to medical treatment may be dealt with surgically by pyloroplasty, a gastroenterostomy, or by excision, depending upon the kind, size, and location of the ulcer. After any sur-

gical operation on the stomach, however, the patient should have medical treatment for several months.

References

Alvarez, Walter C.: The Mechanics of the Digestive Tract, New York, 1922, Paul B. Hoeber.

Carlson, A. J.: The Secretion of Gastric Juice in Health and Disease, Physiol. Rev. 3: 1, 1923.

Dragstedt, L. R., and Vaughn, A. M.: Gastric Ulcer Studies, Arch. Surg. 8: 791, 1924.

Edkins: J. Physiol. 34: 133, 1906.

Hilton, John: Rest and Pain, Cincinnati and Cleveland, 4th Ed., 1891, P. W. Garfield.

Horsley, J. Shelton: Surgery of the Stomach and Small Intestine, New York, 1926, D. Appleton & Co.

Hughson, Walter: Reflex Spasm of the Pylorus and Its Relation to Diseases of the Digestive Organs, Arch. Surg. 11: 136, 1925.

Ivy, A. C., and Farrell, J. I.: Contributions to the Physiology and Gastric Secretion, Am. J. Physiol. 74: 639, 1925.

Ivy, A. C., Lim and McCarthy: Am. J. Physiol. 74: 616, 1925.

Klein, Eugene: Gastric Motility: I. The Origin and Character of Gastric Peristalsis, Arch. Surg. 12: 571, 1926.

Klein, Eugene: Gastric Motility: II. The Conduction of the Gastric Peristaltic Wave, Arch. Surg. 12: 583, 1926.

Luckhardt, A. B., Phillips, H. T., and Carlson, A. J.: Am. J. Physiol. 50: 57, 1919.

CHAPTER VIII

THE MIMICRY OF THE SYMPTOMS OF PEPTIC ULCER*

THE symptoms of peptic ulcer may cover a wide range and are not infrequently vague and indefinite. They depend to some extent upon the type of ulcer, its location and the characteristics of the individual who possesses the ulcer. The symptoms of a peptic ulcer anywhere usually follow in a general way those of a duodenal ulcer. The symptoms of duodenal peptic ulcer may be described under three broad types. In all of them there is a tendency toward latent periods with comparative comfort, followed by an exacerbation of symptoms that occurs more frequently in the spring and the fall.

Symptoms of Peptic Ulcer.—In the first type, the chief complaint is the so-called hunger pain, coming on two to four hours after meals in duodenal ulcers, and sooner in gastric ulcers. This pain is usually relieved by food, soda, gastric lavage or vomiting. The patient sometimes wakens early in the night with pain, which ceases after taking alkalies or milk and crackers. This condition lasts from six weeks to several months, alternating with periods of comparative freedom from symptoms.

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In the second type, the prominent symptom is hemorrhage. The patient may apparently be in good health when hemorrhage suddenly occurs, with vomiting of blood and with tarry stools. Tarry stools and anemia may constitute the only symptoms.

In the third type, there are no definite gastric symptoms, but discomfort in the lower part of the abdomen and sometimes a tendency toward diarrhea. The appetite is poor and there is loss of weight.

These three types of symptoms of peptic ulcer may occur separately or combined. The first and second are commonly associated.

Though these three types or combinations of types cover most of the cases of peptic ulcer, there are occasional instances in which a peptic ulcer produces very confusing symptoms.

For example, Mr. A. K. P., aged 34 years, had a history of having had several previous attacks of what appeared to be kidney colic on the right side accompanied by vomiting. A few hours before admission to St. Elizabeth's Hospital, October 29, 1924, he suffered a very marked attack, which began with pain in the upper right side and concentrated around the region of the right kidney. There was a slight general abdominal pain and tenderness. The urine was cloudy and contained some albumin and a few leucocytes. Cystoscopic examination was negative. The following day the pain seemed to locate in the right iliac fossa, and his appendix was removed. It was swollen and congested. The tissues around it were edematous, particularly around the mesentery of the cecum and ascending colon. A drainage tube was inserted. The appendix

contained some pus. Five days after this operation duodenal and stomach contents appeared through the drainage tube. There was but little pain or muscle spasm in the epigastric region. On November 6 an incision was made through the inner portion of the upper right rectus muscle. The duodenum anteriorly was slightly adherent and showed a few lymph flakes, but in the posterior wall there was marked infiltration. The pylorus was occluded with a kangaroo tendon and a posterior gastroenterostomy was done. The patient died on November 9. Postmortem examination showed the right kidney floating in foul liquid containing duodenal and stomach contents. There was a large ulcer in the posterior duodenal wall, which had perforted retroperitoneally. The duodenal contents had gravitated around the kidney and in the region of the appendix. The symptoms were at first of kidney colic and later were the symptoms ordinarily found in appendicitis.

The symptoms of kidney colic and the symptoms of appendicitis can, therefore, be caused by the perforation of a posterior duodenal ulcer.

It is, however, the mimicry of the two conspicuous symptoms of peptic ulcer, hunger pain and hemorrhage, that chiefly concerns us, and in order to comprehend the mimicry we must consider the cause of these symptoms in ulcer.

Hunger Pains.—Hunger pain in peptic ulcer, particularly in duodenal ulcer, has excited much interest. The work of Cannon and Washburn in 1912 first established definitely that hunger pains in a normal stomach were due to contraction of the gastric muscles. This was ascertained by placing an inflated balloon in the stomach and connecting it by a tube with another balloon emersed in water from

which tracings were made on a kymographic drum. The patient indicated when the pains occurred, and they coincided with the contraction on the balloon in the stomach. Carlson and his associates have elaborated this work and confirmed the original findings of Cannon and Washburn.

The so-called pangs of hunger accompanying a contraction of the stomach show alternating periods of quiet and activity. In investigating the pain of peptic ulcer it was assumed that it was probably an exaggeration of the hunger pains which might occur in a normal stomach. There is extensive literature on this subject, much of it contradictory. A. J. Carlson, H. Ginsburg, W. W. Hamburger and others believe that the pain in duodenal ulcer is due to contraction of the gastric muscles, though the contractions are not usually as deep or powerful in patients with ulcer as in the hunger pains in a normal stomach. B. B. Crohn and A. O. Wilensky, W. L. Palmer and others found that there was no particular gastric contraction in about one-fifth of their patients with peptic ulcer. Reynolds and McClure also found that there was nothing unusual in the gastric and duodenal peristalsis in many of their patients with peptic ulcers. C. W. McClure thinks that as motor abnormalities accompanied pain, and also occurred without pain, both may be due to some common cause. He regards the subject as still indefinite.

It has been shown that when there is unusual contraction of the pyloric portion of the stomach, frequently the duodenum also contracts abnormally. Hunger pains apparently are timed more accurately with contraction of the duodenum or jejunum than with contraction of the stomach, and the tone of the duodenum often rises and falls in coordination with the stomach. Distention of the duodenum is thought by C. M. Jones, of Boston, and others, to cause hunger pains.

An interesting observation by Payne and Poulton showed that apparently there are hunger contractions in the esophagus, and this suggests the possibility that at least some of the pain in peptic ulcer is caused by spasm of the esophagus.

The theory of production of pain by excessive acid in the gastric juice has also stimulated much discussion. A few investigators have been able to increase the discomfort of patients who had an active ulcer by introducing dilute hydrochloric acid into the stomach through a tube. Others have found that the introduction of acid in these patients merely produces a mild burning sensation but not the typical so-called hunger pains (Alvarez). It has been noted, too, that patients with low hydrochloric acid content or even without free acid in the gastric juice have been subject to typical hunger pains.

An important factor has been emphasized by

Palmer, who has shown that much depends upon the irritability of the ulcer. Thus, if the duodenal and gastric mucosa is normal, the ingestion of 100 to 200 c.c. of 0.5 per cent hydrochloric acid causes no symptoms, while symptoms are produced if the ulcer is active, the administration of acid often bringing on a typical attack of pain which is relieved by the usual methods of administration of soda or washing out the stomach. However, in all cases of active ulcer this does not occur, so causation of hunger pain by increased acid does not hold for every case. Ivy has shown that, while normal mucous membrane of the bowel is insensitive to ordinary traumas such as clamping or cutting, when it becomes congested and edematous pinching or cutting causes pain and sometimes vomiting. He believes that the intermittent pain of ulcer is due to changes in tone of the muscles at the site of the ulcer and is produced by local spasm, while continuous pain is due to congestion or swelling around the ulcer from the inflammation.

The important point in these observations seems to be a lowering of the threshold for the stimuli of pain in the nerve endings of the stomach and duodenum. This increased sensitiveness of the sensory nerves is, of course, a common occurrence where the sensory nerves are more abundant, as in the skin. Inflammation in the skin of the hand, for example, will cause even a slight pressure to give pain. So

in the stomach or duodenum the inflammation around the ulcer appears to lower the threshold for the stimulation of the sensory nerves; consequently, normal peristalsis without markedly accentuating the local spasm around the ulcer will be painful. In some cases of peptic ulcer acid may not only increase the sensitiveness of the gastric or duodenal sensory nerves which normally are not exposed to acid because they end in the muscular or submucous coats, but may in this condition actually cause pain. If, however, the threshold for painful stimuli is about normal, the spasm and the excessive acid are without painful effect.

It is commonly known that many external lesions follow this general course. The sensitiveness of a callus or corn may vary even though the corn itself remains apparently unchanged. It is known, too, that there are occasional cases in which the gastric mucosa is intact, and yet so-called hunger pains supposed to be typical of peptic ulcer occur and are relieved by soda or by emptying the stomach.

In pylorospasm, which, as Hughson has shown, may be caused by irritation anywhere within the peritoneal cavity, there doubtless follows a congestion. If the pylorospasm is excessive and prolonged, there may be a hypertrophy of the involved muscle. Hyperemia accompanies increased muscular activity. The hyperemia may accentuate the

sensitiveness of the gastric and duodenal nerves even though the mucosa is intact, and the same mechanics of hunger pains would thus occur from pylorospasm as from ulcer. This seems to be the best explanation of the mimicry of hunger pains by extragastric lesions.

Doubtless the tug of a duodenum on an adherent gall bladder causes irritation of the duodenum and pain by the pull on the gall bladder, which in its turn may also produce pylorospasm. The duodenum has a rather limited range of motion, and any interference with this range is more likely to be resented and to produce symptoms than where the range of motion is free and meets with but little impediment. In the transverse colon or in the jejunum and ileum, adhesions that do not produce obstruction usually give no symptoms, but adhesions about the pylorus or duodenum or about the ileocolic sphincter, where motion though essential is more limited, will often give discomfort or pain. In the same manner adhesions about the heart where the motion is essential but limited may produce marked symptoms.

Hunger Pains from Extragastric Causes.—Dr. W. H. Higgins, of the Medical Department of St. Elizabeth's Hospital, Richmond, Virginia, in an excellent paper on hunger pains, reviews 162 consecutive abdominal operations at St. Elizabeth's Hos-

pital in which there seemed to be some symptoms of disturbed digestion. His analysis is as follows:

In order to determine the relative frequency of this symptom (of hunger pain or food relief) in the more common abdominal diseases, an analysis of 162 clinical histories has been completed. This record comprises all patients with peptic ulcer, chronic cholecystitis and chronic appendicitis operated on at St. Elizabeth's Hospital over a given period. For obvious reasons it does not include any patients with this diagnosis in whom the condition was accidentally found during a laparotomy for other pathologic changes.

This series consists of thirty-three cases of chronic cholecystitis, forty-seven of chronic appendicitis, thirty-four of a combined chronic cholecystitis and appendicitis, and forty-six of peptic ulcer. In the clinical questionnaire used at this hospital, the specific inquiry concerning food relief is made and the reply of every patient is recorded. The character of pain complained of varied as widely as that usually found in a corresponding number of patients suffering from uncomplicated duodenal or gastric ulcers. In every instance a minute postoperative note has been made stating in detail the extent of the pathologic changes present as well as a notation on the condition of the other abdominal organs.

In the first group there were thirty-three cases of chronic cholecystitis. Of these, five, or 15.4 per cent, gave a definite history of food relief.

In the second group there were forty-seven cases of chronic appendicitis. Of these, seven, or 17.5 per cent, showed food relief.

In the third group there were thirty-four cases of combined chronic cholecystitis and chronic appendicitis. Three, or 8.6 per cent, gave a history of food relief.

In the fourth group there were forty-six cases of peptic ulcer. Of these, twenty-one . . . gave a history of food relief.

The interesting feature of this summary is the relative frequency of hunger pains in gall bladder, appendical and duodenal infections. Relief of pain by ingestion of food has been generally recognized as a cardinal symptom of duodenal ulcer, and has

served as one of the most important differential points in the diagnosis of this condition. It is rather remarkable that slightly less than one-half of the ulcer cases in our series gave this history. We may assume from this low percentage that a duodenal lesion alone is not the sole provocative factor, and it becomes more apparent when we find the same symptoms in from 8 to 17 per cent of our chronic gall bladder and appendical cases.

The age of the patient, duration of the illness, percentage of hydrochloric acid or roentgenologic studies apparently bore no relation to the incidence of this complaint.

It is obvious that the symptom of hunger pain is not solely due to peptic ulcer, and that peptic ulcer does not always cause hunger pains. In this series, 45.6 per cent of our cases of peptic ulcer had hunger pains, while this symptom was present in 15.4 per cent of patients with cholecystitis and in 17.5 per cent of cases with appendicitis. There was also a marked difference in cases with adhesions and without adhesions. Of the cases of cholecystitis with adhesions 22.7 per cent had hunger pains, and all of the cases of cholecystitis with a history of hunger pains had adhesions. Adhesions apparently predispose to hunger pains in cholecystitis.

Gastrointestinal Hemorrhage Not Due to Peptic Ulcer.—The mimicry of the symptoms of hemorrhage from a gastric or duodenal ulcer is not infrequent. When blood appears in the stomach or gastrointestinal tract, there are many sources from which it may come. There may be toxic erosions, as occur after burns. Rosenow has shown that injections of certain strains of streptococci often cause

erosions or ulcerations of the duodenal mucosa of the rabbit. Certain chemicals or irritating foods may produce gastric or duodenal erosions. The congestion of the gastric veins from enlargement of the spleen or from hepatic cirrhosis and the large varicose veins around the cardiac portion of the stomach and the terminal esophagus are frequent sources of hemorrhage.

An unusual case of hemorrhage occurred in a patient of mine (Mrs. K. W.) who gave a history of blood in the stools at intervals for several years before admission to the hospital. She became extremely weak and vomited a great deal, though she did not vomit blood. She had been given a blood transfusion, and placed on a milk diet, but without benefit. Physical examination was essentially negative, and gastrointestinal roentgenologic studies were negative. Laboratory examination showed an extreme degree of secondary anemia and a low leucocyte count. A tentative diagnosis was made of duodenal ulcer. At operation, February 20, 1928, the stomach and duodenum were normal. At the hepatic flexure of the transverse colon was a flat mass which was also attached to the jejunum. It was extremely vascular. A part of the jejunum and a part of the transverse colon were resected, and the patient made a satisfactory recovery. The tumor was a vascular, degenerating neurofibroma, arising from the transverse mesocolon. The growth had invaded the upper jejunum at one small point, which was the source of the hemorrhage.

Other Symptoms of "Indigestion."—The other symptoms commonly associated with peptic ulcer are less conspicuous. They consist chiefly of gaseous eructations, nausea with occasional vomiting, and so-called water-brash or heartburn. These are probably from an upset of the motor mechanism of the

stomach and intestines, which is really the cause of the great majority of all gastric symptoms. Alvarez, Klein and others have shown that most of the gastric and intestinal peristalsis is due to what Alvarez terms a gradient movement. The stimulus for peristalsis of the stomach arises from the lesser curvature. The rate of contraction at the point of origin of peristalsis in the lesser curvature near the esophagus is distinctly faster than on the greater curvature about the pylorus. Similarly, it is greater in the upper jejunum, being 20 per minute, than in the lower ileum, where it is about 11 per minute. Things that tend to upset this mechanism, such as irritation where the rate of contraction is normally low, or depression where it is normally high, may interfere with peristalsis to such an extent as actually to reverse the peristaltic current.

Reversed ripples of peristalsis appear to coincide with nausea, and, if marked, vomiting may occur. If there is irritation about the pylorus, the reversed gastric peristalsis may cause regurgitation into the esophagus of the gastric contents and produce symptoms of water-brash and heartburn. This does not necessarily mean that there is an excess of hydrochloric acid in the gastric juice, but merely that it is present in a region physiologically unaccustomed to the acid. It has been shown that in patients who suffer from heartburn or water-brash a small sponge introduced into the esophagus and

left for a few minutes will, when withdrawn, often show an acid reaction, whereas normally the reaction in this region should be alkaline.

These symptoms of regurgitation, eructation, heartburn and nausea may be produced by the irritation from a gastric or duodenal lesion such as a peptic ulcer at the pyloric end of the stomach or in the duodenum, or they may arise from extragastric causes which induce pylorospasm. They may also be due to toxic materials such as products from acute infectious diseases, which tend to weaken the more rapidly contracting sensitive muscles of the upper portion of the stomach and duodenum, while the more hardy muscle which contracts slowly is but slightly, if at all, affected.

Pylorospasm.—The work of Walter Hughson on pylorospasm is interesting. In his experiments on dogs he has shown that there is a tendency to pyloric spasm following an injury to the peritoneum. It is a reflex spasm and the paths of the reflex are through the vagus nerve. After inducing the spasm and delayed emptying of the stomach in dogs by creating a lesion in the cecum, he has then caused normal emptying in these animals by resecting the vagus nerve, and finds that removing the branches of the vagus about the middle of the stomach has the same effect as when the nerve is severed immediately on entering the stomach. Not infrequently,

according to Hughson, an intensely irritable stomach without a gastric lesion may be relieved by section of the gastric branches of the vagus. In several patients with marked gastric symptoms I have done this after removing the apparent cause of irritation, as a diseased gall bladder or appendix, and in most of them there has been relief.

As Hughson has pointed out, pylorospasm may be induced by a lesion anywhere in the peritoneal cavity. Probably the most common source for such a reflex is the appendix. While many appendices doubtless have been removed without benefit, there still remains a definite though small percentage of patients in whom hunger pains and gastric distress form the chief clinical symptoms of appendicitis. The following case illustrates this condition:

Mr. C. B. J., single, aged 28 years, had "stomach trouble" which began about ten years before. At first the symptoms were loss of appetite and dull epigastric pain with no particular relation to meals. There was decrease in weight. He was given an ulcer diet, with some relief for about a year. Then the epigastric pain became more pronounced, began when the stomach was empty and was usually somewhat relieved by food and alkalies. There was occasional nausea, and a considerable amount of gas. There had been at times slight tenderness in the region of the appendix. The laboratory examinations were negative except for low free hydrochloric acid in the gastric juice, and low total acidity. Roentgenologic examination showed what appeared to be a pylorospasm with a possibility of duodenal ulcer, and definite disease of the appendix. At operation, February 4, 1929, there was no evidence of an ulcer, or of a healed ulcer, either in the

duodenum or in the stomach. There was marked pylorospasm, and most of the branches of the gastric vagus nerve were resected. There was a definite chronic appendicitis, and the appendix was removed. The patient made a satisfactory recovery, and when last heard from, three months after the operation, he was symptom-free.

According to Alvarez, there is a reflex connection between the emptying of the lower ileum and the relaxation of the pyloric sphincter. He says, "Just as an emptying of the stomach tends to produce an emptying of the lower ileum into the cecum, so it appears that an early emptying of the ileum may favor an early emptying of the stomach and a slow emptying of the ileum may slow the emptying of the stomach. Considerable experimental work has been done on this subject by Hedblom and Cannon and later by White. They found that in cats they could slow the progress of food through the stomach and small intestines if they irritated the cecum sufficiently with croton oil. Mild degrees of irritation produce no effect on the emptying of the stomach. Similarly in man much depends on the degree of irritation produced by the lesion, upon the stage in which we find the disease and upon the original stability of the gradient in a particular individual."

The following two cases, from many of this kind that I have had, illustrate the relation between gastric symptoms and extragastric lesions:

Mr. M. E. L., aged 25 years, gave a history of "gas on the stomach," dull pain and burning in the epigastrium at intervals, particularly evident about an hour or two after eating. There was no nausea or vomiting. The symptoms had been present about eighteen months. He had lost 25 pounds in weight during the past year. There was for a time some improvement on diet, but the symptoms returned and were more severe than ever. Physical examination showed the patient considerably underweight, but the examination was otherwise practically negative. Laboratory examination showed moderate secondary anemia and was otherwise negative. Roentgenologic examination showed marked hyperperistalsis of the stomach and a defect near the junction of the first and second parts of the duodenum suggestive of ulcer. A diagnosis was made of duodenal ulcer and secondary anemia. At operation on August 11, 1928, the stomach and first portion of the duodenum showed no lesion. About three inches from the pylorus there was a sharp adhesion to the gall bladder which pulled the duodenum upward. The gall bladder and appendix were removed. Both gall bladder and appendix showed chronic inflammatory changes.

Mr. L. R. G., aged 23 years, was admitted to the hospital as an emergency case with a history of rather sharp pain in the epigastrium beginning six hours before admission. The pain radiated slightly to the right lower quadrant. He was nauseated. There was a history of "indigestion" for a number of years with hunger pains and occasional nausea. He was thought to have peptic ulcer. Physical examination on admission showed the lower right rectus muscle spastic. There was tenderness just to the right and below the umbilicus. The leucocyte count was 10,000, with 90 per cent polymorphonuclears. At operation, April 6, 1929, there was a hernia of the ileum under a congenital band which was the mesentery to a rather large Meckel's diverticulum. The appendix was acutely inflamed. No evidence of peptic ulcer could be found.

Conclusion

The symptoms of peptic ulcer are often simulated by other lesions, and occasionally the mimicry may

be very confusing. The cardinal symptoms, hunger pain and hemorrhage, are, however, usually associated with other evidence that may lead to a correct diagnosis. In the atypical cases of peptic ulcer in which both hunger pain and hemorrhage are absent and in cases simulating peptic ulcer, the diagnosis may be extremely perplexing and will require the combination of a careful clinical observation, a thorough laboratory study, and a competent roentgenologic examination in order to determine the facts.

References

Alvarez, W. C.: The Mechanics of the Digestive Tract, 2nd Ed., New York, 1928, Paul B. Hoeber Co.

Cannon, W. B., and Washburn, A. L.: An Explanation of Hunger, Am. J. Physiol. **29**: 441, 1912.

Carlson, A. J.: Contributions to the Physiology of the Stomach. XLIV. The Origin of the Epigastric Pains in Cases of Gastric and Duodenal Ulcer, Am. J. Physiol. **45**: 81, 1917.

Crohn, B. B., and Wilensky, A. O.: Studies in the Variations of the Tonus of the Gastric Musculature in Health and Disease, Arch. Int. Med. **20**: 145, 1917.

Ginsburg, H., Tumpowsky, I., and Hamburger, W. W.: Contributions to the Physiology of the Stomach, xxxv. The Newer Interpretation of the Gastric Pain in Chronic Ulcer, J. A. M. A. **67**: 990, 1916.

Higgins, W. H.: Clinical Significance of Hunger Pains, J. A. M. A. **82**: 599, 1924.

Hughson, Walter: Reflex Spasm of the Pylorus and Its Relation to Diseases of the Digestive Organs, Arch. Surg. **11**: 136, 1925.

Ivy, A. C.: Contributions to the Physiology of the Stomach, Arch. Int. Med. **25**: 6, 1920.

Klein, E.: Gastric Motility, I. The Origin and Character of Gastric Peristalsis, Arch. Surg. **12**: 571, 1926. II. The Conduction of the Gastric Peristaltic Wave, Ibid., p. 583. III. The Mechanism of the Pylorus, Ibid., p. 1224.

McClure, C. W.: Personal Communication, May 15, 1929.

Palmer, W. L.: (a) The Mechanism of Pain in Gastric and Duodenal Ulcers. I. Achlorhydria, Arch. Int. Med. **38**: 603, 1926.

Palmer, W. L.: (b) The Mechanism of Pain in Gastric and Duodenal Ulcers. II. The Production of Pain by Means of Chemical Irritants, Arch. Int. Med. **38**: 694, 1926.

(c) The Mechanism of Pain in Gastric and in Duodenal Ulcer. III. The Rôle of Peristalsis and Spasm, Arch. Int. Med. **39**: 109, 1927.

Payne, W. W., and Poulton, E. P.: Visceral Pain in the Upper Alimentary Tract, Quart. J. Med. **17**: 53, 1923.

Reynolds, L., and McClure, C. W.: Motor Phenomena Occurring in Normal Stomachs, in the Presence of Peptic Ulcer and Its Pain, as Observed Fluoroscopically, Arch. Int. Med. **29**: 1, 1922.

CHAPTER IX

PEPTIC ULCER AND CANCER OF THE STOMACH*

THE etiologic relation of peptic ulcer to cancer of the stomach is acknowledged by all pathologists who have studied the subject. There is, however, a great difference of opinion as to the number of cases of cancer of the stomach due to peptic ulcer. The incidence varies from about 2 per cent, estimated by Ewing[1] of New York, to more than 60 per cent by MacCarty[2] of the Mayo Clinic. MacCarty says that, in about 70 per cent of the chronic gastric peptic ulcers, cells can be found that present the cytologic appearance of cancer. Though MacCarty does not state that this percentage of chronic gastric peptic ulcers would eventually become cancer, such a conclusion is suggestive. The opportunities at the Mayo Clinic for examining fresh tissue are great. According to W. J. Mayo,[3] "von Eiselsberg of Vienna reported that 30 per cent of all ulcers of the pyloric end of the stomach which he was able to resect proved to be undergoing cancerous degeneration," and Finsterer reports that "26 per cent of gastric ulcers, in all parts of the stomach, have proved to be undergoing cancerous degeneration."

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Cabot and Adie[4] reported five cases out of fifty-six gastric cancers in which there was clear evidence, even according to Professor Warthin (who is inclined to minimize the etiologic relation of peptic ulcer to gastric cancer), that cancer developed secondarily to chronic peptic ulcer.

Scott[5] of the University of Rochester, N. Y., described three cases in which there were symptoms of gastric peptic ulcer extending over a number of years and which proved to be cancerous. In one of these patients with symptoms for twelve years, an adenocarcinoma was in the margin of the ulcer. In two others, carcinoma was found in the base of the ulcer; in one the clinical symptoms of peptic ulcer had existed for five years and in the other for thirty years. In one of these two the free hydrochloric acid was 70 and in the other 52. Scott believes that of all cases clinically diagnosed as chronic gastric ulcer, from 10 to 20 per cent are actually cancerous.

The symptoms of cancer of the stomach are frequently vague and indefinite, particularly when cancer does not follow peptic ulcer. In many cases the progress of the disease is rapid from the first mild symptoms of "indigestion." It is this type of cancer of the stomach that presents great difficulties for early diagnosis. There is no reason, however, why physicians should shut their eyes to the other type, even though it may not represent the majority of the cases in which there is a definite

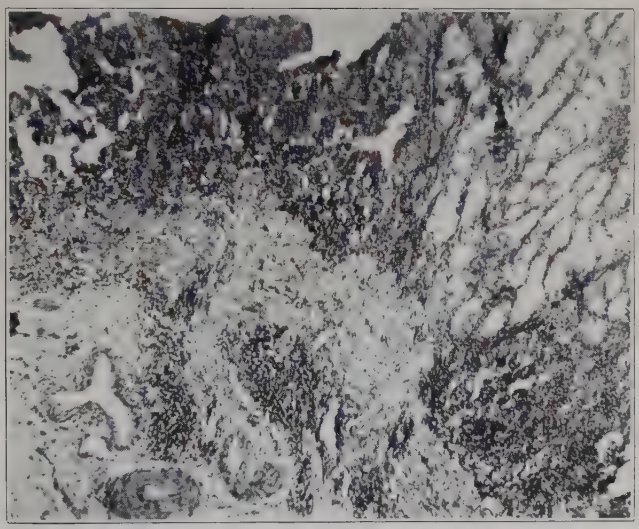

Fig. 2.—Section through the base and margin of the gastric ulcer. The top layer of the floor of the ulcer consists largely of small round cells beneath which is connective tissue. On the right are normal gastric glands with areas of leucocytic infiltration. Reduced from a photomicrograph with a magnification of 80 diameters.

history of symptoms, often resembling those of gastric peptic ulcer, extending over a period of months or years.

Symptoms of gastric peptic ulcer themselves are by no means always clear-cut. Hunger pain is often absent, nor is the relationship of food to the symptoms constant. The intake of food in the larger ulcers usually aggravates the pain. When, however, there is a diagnosis of gastric ulcer and when it does not show some improvement in clinical symptoms or in healing when examined roentgenologically after a few weeks of careful treatment, it would seem that the patient should be operated on and the ulcer removed, preferably by a partial gastrectomy.

Scott[5] has called attention to the fact that cancerous gastric lesions sometimes appear to heal partially when examined at intervals roentgenologically. This may be due to the contraction of the scirrhous-like tissue around the cancer, while the growth is actually infiltrating farther into the wall of the stomach.

Statistics furnished by the Census Bureau of the United States show that in 1926 cancer of all organs caused 99,833 deaths, while deaths from cancer of the stomach and liver numbered 35,694, of which 19,611 were in males. When one considers that primary cancer of the liver is uncommon and that cancer of the liver is usually a metastasis from the

stomach, pancreas or intestine, it is apparent that cancer originating in the stomach probably accounts for one-third of all the deaths from cancer in the United States. If, then, as I think can be conservatively estimated, at least one-fifth of the cases of cancer of the stomach arise from peptic ulcer, it would seem advisable to watch patients with gastric peptic ulcer with great care. If removal of so-called precancerous lesions elsewhere in the body is a good policy, this should be eminently a proper procedure in ulcers of the stomach that do not respond readily to competent medical treatment.

The fact that peptic ulcer in the duodenum does not cause cancer is no argument against the etiologic relationship of peptic ulcer and cancer in the stomach. The stomach is tissue that is particularly prone to cancer. In the duodenum, cancer rarely arises. In tissues prone to cancer, as the mouth, lips, the skin of the face, the mammary gland and the cervix uteri, it is well known that an irritation or a small lesion acts as a starting point for cancer. It seems illogical not to recognize such a relationship in the stomach. In some regions of the body, as the palms of the hands and soles of the feet, irritation does not appear to produce cancer; possibly such tissue has been so stabilized in the evolutionary process that control of its cells has been well established. At any rate, malignant conditions do not tend to arise in these regions. But wherever

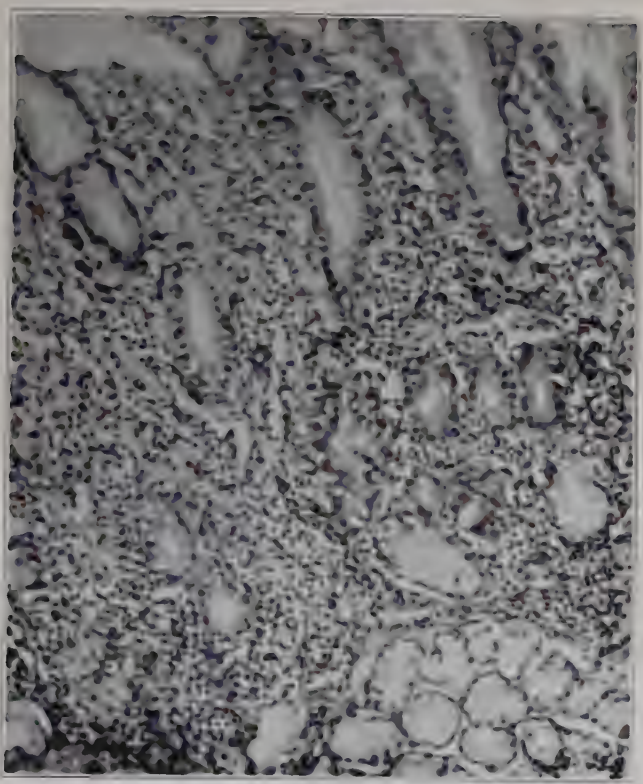

Fig. 3.—Tissue near the gastric ulcer shown in Fig. 2. Through the transverse center are gastric glands showing evidences of irregularity but not of malignancy. At the top and bottom are normal gastric glands cut at different angles. Reduced from a photomicrograph with a magnification of 160 diameters.

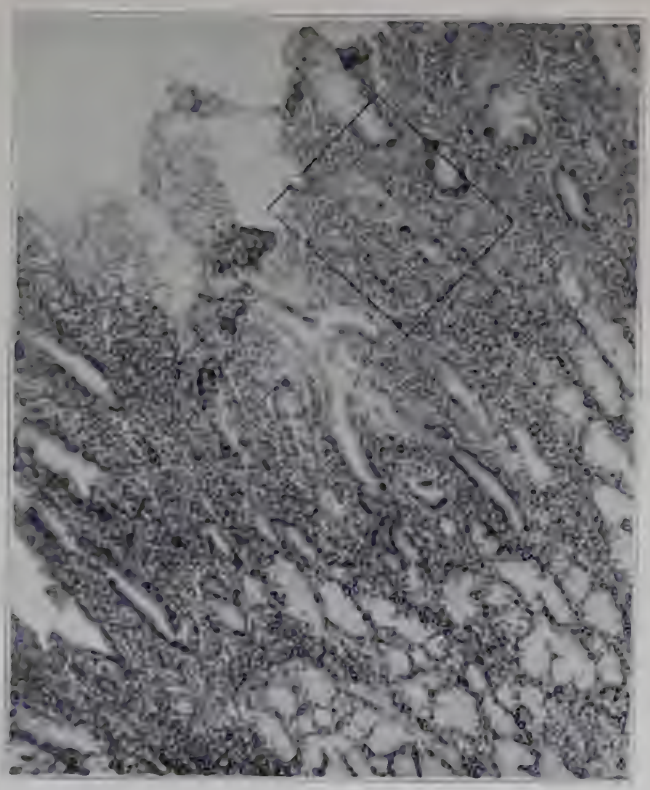

Fig. 4.—Area near the gastric ulcer shown in Fig. 2. In the section marked off by the squares are two acini that present histologic evidences of cancer. These acini are surrounded by gastric glands that appear to be normal in most instances. Some of them, however, are slightly irregular, probably because of reparative processes. Reduced from a photomicrograph with a magnification of 80 diameters.

malignant conditions do tend to arise, irritation is one of the great factors in the causation of cancer.

The following case is interesting because of the relationship between ulcer and cancer:

Mrs. L. E. H., aged 70, whose height was 65 inches (165 cm.) and weight 120 pounds (54 Kg.), had had "stomach trouble" for about fifteen years, with dull pain in the lower epigastrium at intervals without relation to meals. There was some nausea but no vomiting until a week before admission to the hospital. Recently there had been a slight loss of weight. There was no hematemesis and no melena. A roentgenogram of the stomach taken about a year before admission did not seem to show a lesion. The symptoms, however, continued and within the last few months before examination had been worse. Roentgenologic examination by Dr. L. F. Magruder of Norfolk, Nov. 23, 1928, showed a marked defect in the pyloric end of the stomach. The patient was admitted to St. Elizabeth's Hospital, November 30. Repetition of the roentgenologic examination by Drs. F. M. Hodges and L. O. Snead of Richmond confirmed the observations of Dr. Magruder; there appeared to be almost a complete occlusion of part of the pyloric portion of the stomach extending from near the left boundary of the pyloric antrum to within the pyloric canal. There was very little free hydrochloric acid in the gastric juice. The patient was given hydrochloric acid for several days before operation. The administration of the hydrochloric acid in these cases, as suggested by Dr. W. H. Higgins of St. Elizabeth's Hospital, undoubtedly decreases the bacterial growth in the stomach by adding an antiseptic that is normally found in the gastric juice.

December 10, I did a partial gastrectomy under local anesthesia, using a modification of the Billroth I method, a description of which I[6] have published elsewhere. The essential features of the operation are that, in order to preserve the axis of peristalsis and to render suturing safer, the lesser curvature of the stomach is united to the upper border of the duodenum, and an incision is made in the anterior wall of the duodenum, flaring it open so that

it can be sutured to the stomach without the danger of subsequent contraction and obstruction at the union.

The patient made a satisfactory recovery from the operation and left the hospital Jan. 3, 1929. Since then she has been in good health.

The specimen consisted of the pyloric portion of the stomach and measured 7 cm. along the lesser curvature and 13 cm. along the greater curvature. On the pyloric end there was a small cuff of duodenum attached. There was a lesion on the lesser curvature toward the posterior wall, about half way between the pyloric and the cardiac ends of the specimen. It infiltrated slightly the surrounding tissues, was oblong and superficially ulcerated, and measured 2 cm. in it longest diameter. It appeared to be an old ulcerated lesion with some inflammatory deposit and a possibility of early malignant growth. The remainder of the specimen of the stomach appeared to be normal. The lesion was not prominent, though it could be well recognized on inspection and palpation of the stomach from without. The extensive roentgenologic defect was obviously due to spasm. It seems probable that when the roentgenologic examination was made a year before there was very little spasm and the lesion, though present, was inconspicuous. With an exacerbation of the inflammation around the lesion, the spasm was marked and produced for a time almost complete obstruction.

Histologic examination showed in most of the slides the typical appearance of gastric ulcer. The excavation was not deep. At the base of the ulcer was leucocytic infiltration and connective tissue without any evidence of a malignant condition (Fig. 2). At the margins the gastric glands were usually normal; in some places there were hyperplasia and irregularity of the epithelium, as though the glands were in the act of repairing (Fig. 3). Throughout the sections there were areas of leucocytic infiltration. In one small place in one slide there were two acini that showed the structure of carcinoma. These two acini had the distinctive features of cancer (Figs. 4, 5 and 6). There were mitotic figures; the nuclei were irregular, and the cells were irregularly placed. The nuclei in most instances were large and stained well. The basement membrane apparently was not continuous. That the

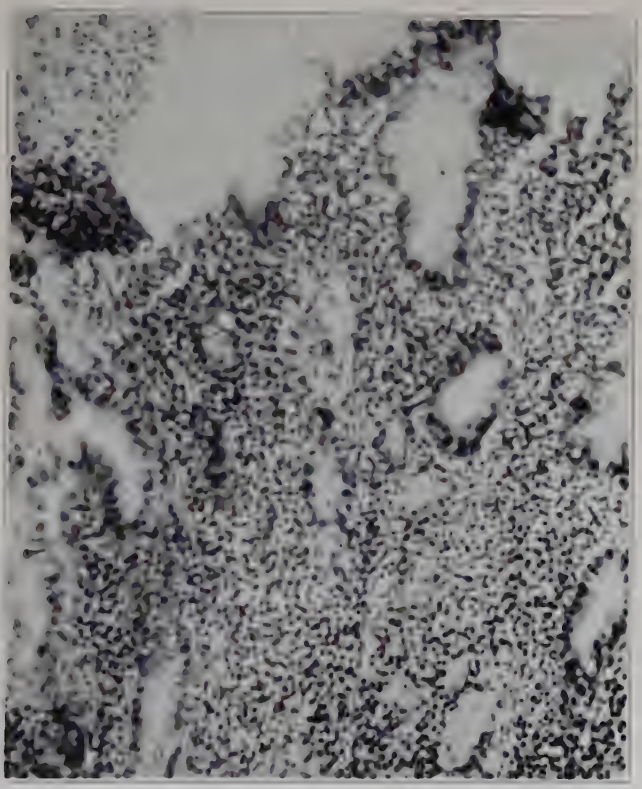

Fig. 5.—Higher power magnification of the tissue shown blocked out in Fig. 4. On the right of the two acini is a somewhat irregular gastric gland. Throughout the rest of the section, however, most of the gastric glands appear to be normal. Reduced from a photomicrograph with a magnification of 160.

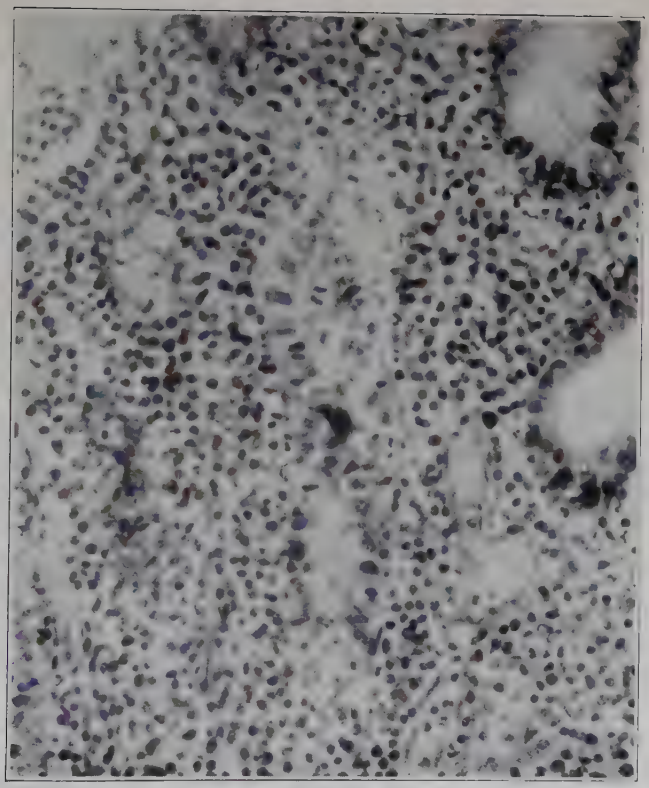

Fig. 6.—Higher magnification of the area in Fig. 5. The two acini showing cancerous structure are about at the longitudinal center. In the upper one is a bipolar mitotic figure. In the lower acinus is a wreath mitotic figure seen on the edge. In both of these acini the nuclei are very irregular, many of them deeply stained. The cells are irregularly placed. The basement membrane at portions of the acini seems to have disappeared. The cells in some areas are piled up without any order. They present the features of adenocarcinoma. To the right of these acini is an acinus which has some irregular cells, but they are fairly mature, as shown by the lumen, and are probably partly influenced by repair. They could not be called malignant. Reduced from a photomicrograph with a magnification of 275 diameters.

structure of the two acini was cancerous hardly admits of doubt, and yet around them were normal gastric glands. Though serial sections were not made, other blocks from different portions of the ulcer did not show cancer, which was found in only one slide.

Comment

It seems improbable that this small cancerous spot had existed for fifteen years during the time of the gastric symptoms. The logical conclusion is that this microscopic area of cancer had recently arisen in the region of the gastric ulcer as a result of the irritation of the ulcer. As the two acini constituted all the definite cancerous tissue found in this case, it is possible that a thorough histologic examination of gastric ulcers may show the incidence of incipient cancer greater than it is generally believed to be.

References

1. Ewing, J.: Ann. Surg. 67: 715, 1918.
2. MacCarty, W. C.: Pathology and Clinical Significance of Stomach Ulcer, Surg. Gynec. Obst. 10: 449, 1910; The Histogenesis of Cancer of the Stomach, Am. J. M. Sc. 149: 469, 1915.
3. Mayo, W. J.: Discussion, Tr. Am. Surg. A. 43: 352, 1925.
4. Cabot, Hugh, and Adie, G. C.: Etiology of Cancer of the Stomach, Tr. Am. Surg. A. 43: 320, 1925.
5. Scott, W. J. M.: The Relationship of Carcinoma and Callous Gastric Ulcer, Surg. Gynec. Obst. 46: 199, 1928.
6. Horsley, J. S.: Operative Surgery, St. Louis, 1928, Ed. 3, C. V. Mosby Company; Partial Gastrectomy, Surg. Gynec. Obst. 44: 214, 1927.

CHAPTER X

SOME CONSIDERATIONS CONCERNING THE TREATMENT OF CANCER*

THE problem of cancer is one that touches every branch and specialty of medicine. Public health authorities are recognizing the importance of cooperation with the movement to control cancer. The mortality of this disease ranks today among the chief causes of death. According to the Census Bureau for the year 1926, there were in the United States 99,833 deaths from cancer.

While different specialties may be chiefly concerned with particular types of cancer, such as the neurologists with glioma, and the dermatologists with basal cell cancer, there is always an underlying basis upon which all varieties of malignant tumors rest. The general practitioner usually comes in the earliest contact with cancer, and his is the chief responsibility in the making of an early diagnosis and in the recommendation of proper treatment. Without some conception of the nature of this disease, it is impossible intelligently to comprehend its symptoms, its progress and the principles on which it should be treated. The great variety of cancers, from the comparatively benign skin lesion of the

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small basal cell cancer to the malignant melanotic growths of the skin, from slowly growing giant cell sarcoma to the virulent sarcoma of the cortex of the bone, shows the wide range of malignancy, and, consequently, in treatment.

Therapy is sometimes based on a knowledge of etiology, as in the use of vaccines and sera. The initial cause of cancer in the sense in which we are acquainted with the etiology of tuberculosis or of typhoid is unknown, but we must recall that because we can identify the bacillus of tuberculosis or of typhoid fever it does not mean that the ultimate cause of these two diseases has been found; for no one yet knows what produces these bacilli. That the initial cause of cancer is some abnormal growth in the cell structure is rather generally accepted. The confusion of cancer cells with embryonic cells is unfortunate. Both embryonic cells and the malignant type of cancer cells do grow rapidly, but the embryonic cells, no matter how rapid their growth, go through a certain definite cycle and attain their maturity—whereas in a malignant growth the cells never quite attain maturity. The more nearly maturity is approximated the less virulent the growth usually is. It is on this basis of approximation to maturity that A. C. Broders, of the Mayo Clinic, has done such excellent and practical work in grading the malignancy of cancer, particularly of can-

cer of the skin and of the uterus, and of many other organs.

The theory that cancer is due to a parasite or a microbe has been discussed extensively in times past and now has advocates. The most generally accepted opinion, however, is that cancer originates as a result of some irritation—traumatic, toxic or chemical—which induces the cell to grow regardless of the controlling influence of the tissue from which it springs. After this property of lawless growth is acquired the cell seems to have the power to transmit this characteristic to its offspring.

The most prominent recent work concerning the microbe origin of cancer is by Gye, of England. His theory is that the cause of all malignant tumors, both in man and lower animals, is a microbe that is filterable but that can be cultivated. This microbe, according to Gye, is unable to create cancer until the resistance of the tissues of the host has been specifically overcome by a second cellular product which he thinks is a chemical stimulant and which he calls a "specific factor." Gye believes that one particular filterable microbe is responsible for all malignant growths, but that this "specific factor" must be present for the tumor to be produced and that the "specific factor" determines the type of tumor.

The well-known sarcoma of Plymouth Rock chickens, discovered by Rous, was taken as a basis.

Gye made cultures and subcultures of this virus, or filterable microbe as he terms it, and, for experimental injection into animals, mixed it with an extract from a malignant tumor, the virus of which is supposed to have been killed by treatment by chloroform with the "specific factor" or chemical stimulant still potent. When the culture is mixed with a similarly treated extract of a mouse sarcoma and is introduced into a mouse, sarcoma results; or with an extract from chicken sarcoma and injected into Plymouth Rocks the chicken sarcoma is produced. In other words, when the extract from a tumor is treated, preferably with chloroform, so that the virus in it is supposed to be killed but the "specific factor" remains, and this is introduced along with the subculture of Gye's so-called filterable microbe, which in itself will not cause a tumor, a tumor of the type from which the extract was obtained is produced.

In an excellent article by Kolmer and Harkins convincing experiments are detailed which seem to show the fallacy of Gye's contention. The virus in the "specific factor" extract when mixed with chloroform according to the technic of Gye is only attenuated, not killed. Kolmer and Harkins have produced tumors merely by using the so-called "specific factor," treated as Gye has recommended, without the culture; but when it is treated longer with more powerful antiseptics no tumor results,

either when this "specific factor" is used alone or with a subculture of the so-called filterable microbe.

The theory of Montrose T. Burrows, of St. Louis, is that a cell, possibly on account of irritation, is disassociated from the surrounding cells in such a manner that the circulation of the fluids around it becomes stagnant, and yet the cell has sufficient vitality to resist destruction. The cell products, which he likens to vitamines A and B, accumulate in the stagnant fluid surrounding the cell, and growth without law and order results, the cell acquiring the power of transmitting this method of growth to its offspring. According to Burrows the growth of the cancer depends to a large extent upon the amount of archusia (S), or vitamine B, which the cells form and retain. Vitamine A is somewhat of an inhibitor, and according to Burrows cancerous tissue has high vitamine B and low vitamine A value, while in normal tissue it is the reverse. If, however, vitamine B is in very great concentration, the cancerous tissue becomes necrotic. This concentration he describes as S^4, but in S^2 or S^3 cancer thrives, while S^1 is too weak for it.

A. W. M. White, following the general technic of Carrel, has produced sarcoma in chickens by injection of a mixture of dilute arsenious acid in embryonic pulp, the tumor apparently arising from the embryonic tissue and not from the tissues of the host. This mixture was injected into the pectoral

muscles of chickens and the arsenious acid seemed to be necessary to bring about the malignant change.

Thomas Lumsden, in interesting experimental work from the Department of Experimental Pathology of Lister Institute, London, reports on the treatment of sarcoma in rats by the injection of formalin. Lumsden says that specific antisera can be produced which will kill cancer cells in vitro and which occasionally seem to cause retrogression of the tumor in the experimental animal. The latter results, however, are uncertain. Lumsden thinks that this cure from sera and the subsequent immunity is due to the presence of certain antibodies in the serum aided by the secretion from the extravasated leucocytes. According to Lumsden the serum from normal rats does not produce this immunity. After injections of the anticancerous serum the rat acquires immunity against subsequent implantation of the tumor. Formalin he suggests as a substance which, while killing the cell, tends to fix it without materially altering its chemical constitution. In this way the antigenic factors in the cell may be preserved. Attempts to produce immunity in normal rats by injecting an emulsion of tumor cells which had been treated with formalin were unsuccessful, but, by injecting formalin into a tumor caused by implantation into rats of the Jensen rat sarcoma, Lumsden found a high percentage of cures. Within a week after the implantation

tumors of about one inch in height and weighing roughly from 1/150 to 1/100 of the animal's body weight resulted, and normal regression very rarely occurred, 95 per cent of the animals dying in three to four weeks. When the tumors, however, were six to eight days old, about 1 to 2 c.c. of a 1 per cent solution of formalin in distilled water injected slowly into the tumors caused a considerable area of inflammation. The first dose is from 0.5 to 1 c.c. The second may be given six to eight hours later, when the local edema disappears. A total of about six or eight injections is usually given. He produced cures in 77 per cent of the rats, and immunity was conferred in about 93 per cent of the rats cured. If the serum of a rat whose tumor is disappearing as a result of this treatment is added to a culture of mouse cancer cells, it seems to damage the cells very seriously, whereas normal rat serum does not do this.

This treatment, according to Lumsden, is not applicable after the tumor is well advanced, because the antibodies that are formed are so quickly absorbed by the large tumor that the animal has not enough resistance to produce the quantity of antibodies necessary to inhibit the growth. If, however, the tumor is not too far advanced, in rats representing about 1/150 of the animal weight, the results seem to be excellent. The application of this

formalin treatment to carcinoma, however, is not so satisfactory.

Francis Carter Wood has often called attention to the fact that the treatment of transplanted malignant tumors in rats represents quite a different situation from that of a spontaneous tumor in which the relation between the tumor and the tissues of the host is doubtless more intimate than when a tumor originating in a foreign field is introduced.

According to the theory of Blair Bell, cancer begins probably from an irritation of some kind in which the cell is separated from its normal nutrition and "dedifferentiates," or reverts to the properties of the trophoblastic cells. The early trophoblastic cells of the embryo are not in contact with the blood stream of the mother's uterus, and so cannot live by oxidation, but must perish or else maintain energy and survive by the property of splitting glucose. After there is an abundant union with the blood supply of the mother's uterus the function of the trophoblastic cells diminishes. Blair Bell found that the women workers in lead would frequently abort, and an examination of the membranes seemed to show that the chief pathologic feature was degeneration of the trophoblastic cells. Assuming, then, that early cancer arises from a reversion of the normal cell to a trophoblastic type, or "dedifferentiation" as Blair Bell calls it, it

would seem that lead which affected adversely the trophoblastic cells might similarly affect cancer cells. Acting upon this theory, the injection of so-called colloidal lead has been done by Blair Bell in many cases. In a few there have been favorable results. In order to produce a cure, however, the lead treatment must be carried to a point of toxemia and is by no means free from danger. This has been combined also with radiation.

Francis Carter Wood has reported the effect of combined radiation with lead therapy in a large series of rats. His experiments seemed to show that a combination of lead, given according to the Blair Bell method, and roentgen-ray treatment is more effective in carcinoma of great virulence in rats than lead alone, but in sarcoma of even greater growth the injection of lead does not increase the effectiveness of the roentgen-ray treatment. He also concludes from experiments in rats that the addition of dextrose to the lead mixtures or preliminary injection of dextrose followed by lead does not increase the efficiency either of the lead or of the roentgen-ray in its action on the tumors.

I have used intravenous injections of lead prepared according to the method of Blair Bell in four cases of inoperable cancer. There was no marked benefit in any case, and I have abandoned this treatment. Possibly in a larger series of cases some patients might have been helped.

There are other important factors concerning the causation of cancer aside from the direct cause. Certain individuals seem to have a predisposition toward a malignant growth. The work of Maud Slye is well known and shows that in mice cancer is usually a recessive and by proper breeding the tendency toward cancer may be almost eliminated; or, on the other hand, by breeding from cancer strains on each side, a large majority of the progeny will develop cancer. The nature of this predisposition is not known. It apparently has something to do with the inhibitory control of cells. These observations of Maude Slye are of much eugenic interest in the prevention of cancer.

Not only in certain individuals but also in certain tissues, cancer is more likely to occur than in others. Primary cancer is almost unknown in the palms of the hand or the palmar surfaces of the fingers, and yet these regions are notoriously more subject to irritation than other tissues of the body. It would seem that since preevolutionary times these tissues have acquired a stability and control over their cells which render anarchistic growth in its constituents impossible. On the other hand, tissues that have been subject to irritations that might be considered from a biologic standpoint comparatively modern, such as from tobacco in the mouth or from the plates of false teeth, appear to be susceptible to cancer from such irritations. These factors are so

comparatively recent in the history of the human race that the tissues they affect do not appear to have acquired sufficient control over their cells to resist them.

The stomach is peculiarly predisposed toward cancer, and about one-third of all deaths from cancer are from gastric cancer. The stomach is, embryologically speaking, of somewhat recent origin, arising as a pouch about the third week of fetal life and being developed by a bulging along the greater curvature. Then, too, food, sometimes highly spiced or hot, reaches the stomach which acts as a kind of buffer for the rest of the intestinal tract. In the duodenum there is much irritation, if we can judge by the incidence of peptic ulcer. However, cancer of the duodenum is extremely rare.

The etiologic effect of peptic ulcer on cancer of the stomach has been much discussed. MacCarty of the Mayo Clinic finds that there is cytologic evidence of cells resembling cancer cells in about 70 per cent of chronic gastric ulcers. Ewing, on the other hand, puts the incidence of cancer from peptic ulcer as low as 5 per cent, or even lower. In an excellent article by W. J. M. Scott this subject is reviewed. Scott reported three personal cases in each of which there were clinical symptoms of gastric ulcer for years before the patient was operated upon. At operation the ulcer was carcinomatous. In one of these cases adenocarcinoma was found

only in the margin of the ulcer, which appeared to be a chronic peptic ulcer. In the other two cases cancer was at the base of the ulcer. In the first case there was clinical evidence of peptic ulcer for twelve years before the patient was operated upon; in the other two, the symptoms of peptic ulcer existed for five years and for thirty years respectively.

In one of these two cases the free hydrochloric acid was 70, and in the other 52. Scott thinks that 10 to 20 per cent of all cases that are diagnosed clinically as chronic gastric ulcers are really cancers. There may be a low-grade cancer of the stomach which breaks down as an ulcer and exists for years and then may take on greater malignancy, but it seems certain that there is in some cases a change along the margin of a gastric peptic ulcer into cancer. Clinically these two conditions are similar. Even cases of early malignancy of the stomach occasionally show roentgenologically some apparent healing of the filling defect, so such an observation is not always an accurate means of excluding malignancy.

After careful treatment of a gastric ulcer for several months with proper medical measures, if the symptoms have not been relieved or if the ulcer has not markedly decreased, it would seem the part of wisdom to explore and probably do a partial gastrectomy. This operation has been usually satisfactory, and in skilled hands there is no higher

mortality rate than from a moderately extensive local excision of the ulcer, while the functional results are often better.

The fact that the majority of gastric cancers seem to arise from some cause other than the irritation produced by peptic ulcer should not blind us to the considerable number of cancers of the stomach that do apparently spring from a chronic peptic ulcer and that may be prevented or cured in an early stage by removal of the ulcer. Certainly it would be contrary to all we know about the origin of cancer to believe that in tissue particularly predisposed toward cancer, as the stomach is, there is no etiologic relation between the constant irritation by a chronic gastric peptic ulcer and cancer of the stomach.

In peptic ulcer of the duodenum, medical treatment can be continued longer, as the danger from cancer in this region is so slight as to be almost negligible. The chief indications for operation in duodenal ulcer would be discomfort, perforation, hemorrhage or obstruction.

Of great aid in the treatment of cancer is the grading of the malignancy. This, as introduced by A. C. Broders, of the Mayo Clinic, is helpful in a practical clinical way. Thus, in the scale running from 1, the least malignant, to 4, a cancer of the lip which shows only grade 1 malignancy, where the cells tend to differentiate almost to normal cells and

where there are many "pearls," requires only a local operation; whereas a cancer with histologically less differentiated cells requires an extensive operation, probably with treatment by radiology in order to effect a cure. By utilizing this method, operations on extensive cancers may sometimes be undertaken with much more hope for benefit or cure than on smaller growths that are histologically more malignant. The type and the extent of the operation or treatment may thus be indicated by the histologic appearance of the cancer.

As an illustration of the practical results of this method, let me report a case of a man, A. T., white, age 62, who had had an ulcer on the lower lip for ten years. He consulted me November 3, 1923. The growth was extensive, occupying most of the entire lower lip. There was a single rather large metastasis in the left inferior maxillary region. Biopsy showed a spinous cell cancer with numerous pearls and markedly differentiated cells. It was grade 1 in malignancy. A moderately extensive excision of the primary growth and of the metastasis with some of the surrounding tissue in the left submaxillary region resulted in recovery and apparently in cure. At the present time, four and a half years after the operation, there is no recurrence.

If such a case had proved to be grade 3 in malignancy, operation would have been utterly useless, and recurrence would have been almost immediate.

On the other hand, a small lesion which showed a higher malignancy would have required a much more extensive operation.

In excising a cancer, particularly about the face and mouth, the cautery should usually be employed. When a wide block dissection can be made, the use of the cautery is not so essential. In biopsies for diagnosis the cautery should be used if possible, or at least carbolic should be applied to the wound immediately after the excision.

The evil effects of massage of a cancerous growth have been obvious clinically. Leila Charlton Knox, E. E. Tyzzer, and Millard C. Marsh have shown that in mice massage of a malignant tumor, either transplanted or spontaneous, produces more frequent and more extensive metastases than in controls in which the growth is not massaged. In these days of chiropractic and osteopathic treatment it is well to bear this in mind. Sarcomas of the leg or tumors of the breast that have been submitted to massage and the rubbing in of ointments have a distinctly more unfavorable prognosis that if such treatment had not been applied. In a case, Miss T., in which ointments had been rubbed on a tumor of the breast and a radical operation was later done by me, though histologically the cancer did not appear to be unusually malignant, the patient died about six months after the operation with extensive metastases everywhere. On another patient, Mrs. B., whose cancer

of the breast appeared histologically more malignant but had not been massaged, the same operation was done about the same time, and the patient was well and free from recurrence eight years after operation.

In the treatment of cancer, not only must the type of tumor be recognized and the proper kind of treatment adapted to it, but also particularly in the more malignant cancers the treatment should be instituted as early as possible, though the earlier the diagnosis is made the more difficult it is. Yet diagnosis must precede intelligent treatment.

The method of growth and of metastasis should also be studied. In basal cell cancer, for example, there seems to be no tendency to metastasize. This type of cancer occurs largely in the face and around the ears. In has access to the same lymphatics that the spinous cell cancer has, and the cells are at least no larger. Apparently, the absence of metastasis is not due to the fact that the cells fail to be transported, but that there is an inherent resistance of the tissue around a basal cell cancer which must be overcome by some product elaborated by this cancer before it can grow. This resistance, however, does not seem to exist for the cells of spinous cell cancer, particularly in its more malignant types.

In fifteen cases of basal cell cancer, most of them quite extensive, I have utilized this pathologic prin-

ciple of the resistance of normal tissue to basal cell cancer, and after excising the cancer with the cautery flaps were transplanted from a distance to cover the raw surface and to exert an inhibitory influence upon a potential recurrence. How deep this inhibitory influence goes it is difficult to say, but it seems to extend to a depth of about 0.5 cm. At any rate, in none of the six cases in which there was a recurrence has the basal cell cancer recurred within the transplanted flap or in immediate contact with it, whereas in a spinous cell cancer of no very great malignancy in which a flap was transplanted for cosmetic purposes the growth recurred in the flap and destroyed it.

It would seem, then, that in basal cell cancer this principle of transplanting tissue from a distance to inhibit the recurrence of basal cell cancer should be utilized, at least in advanced stages of this disease.

Conclusions

Improvement in the results of the treatment of cancer depends upon the coordination of many factors which may in some instances be difficult. Among these factors are the prevention of cancer by eugenical measures according to Maud Slye, the promotion of early diagnosis, the removal of precancerous lesions and the application of pathologic principles and the results of well-established experimental work to the clinical treatment of cancer.

References

1. Burrows, Montrose T.: Studies of the Cause, Prevention and Treatment of Cancer, Southern M. J. **19**: 279, 1926.

2. Ewing, J.: Neoplastic Diseases, Philadelphia, Ed. 2, p. 561, 1922, W. B. Saunders Company.

3. Gye, W. E.: Etiology of Malignant New Growths, Lancet **209**: 109, 1925.

4. Horsley, J. Shelton: Transplantation of Distant Skin Flaps for the Cure of Intractable Basal-Cell Carcinoma, Ann. Surg. **82**: 14, 1925.

5. Knox, Leila Charlton: The Relationship of Massage to Metastasis in Malignant Tumors, Ann. Surg. **75**: 129, 1922.

6. Kolmer, John A., and Harkins, Malcolm J.: A Further Study of Gye's Hypothesis on the Etiology of Malignant Tumors, J. Cancer Research **11**: 217, 1927.

7. Lumsden, Thomas: Vaccine Treatment of Implanted Tumors in the Rat, Lancet **213**: 1283, 1927.

8. Marsh, Millard C.: Tumor Massage and Metastases in Mice, J. Cancer Research **11**: 101, 1927.

9. Scott, W. J. M.: The Relationship of Carcinoma and Callous Gastric Ulcer, Surg. Gynec. & Obstet. **46**: 199, 1928.

10. Slye, Maud: J. Cancer Research **5**: 53, January, 1920; J. Cancer Research **7**: 107, May, 1922.

11. Tyzzer, E. E.: J. M. Research **28**: 309, 1913.

12. White, A. W. M.: A Study of Sarcoma of the Fowl Produced by Arsenic and Embryonic Pulp, J. Cancer Research **11**: 111, 1927.

13. Wood, Francis Carter: Combined Radiation and Lead Therapy, J. A. M. A. **89**: 1216, 1927.

CHAPTER XI

MODERN METHODS OF PREOPERATIVE AND POSTOPERATIVE TREATMENT*

THE object of medicine and of surgery is to save human lives and to relieve suffering. This effort appears obviously commendable, yet there are features of it which admit of discussion.

The prolongation of human life seems to be generally accepted as an unmixed blessing. While the lengthening of life and the relief of suffering are admirable endeavors, the medical profession generally, and surgeons to a marked degree, have still another opportunity and obligation, the responsibility of which they cannot fully escape. What is to be done with the life that has been prolonged? There are doubtless many communities containing a few individuals the shortening of whose lives would be a distinct civic asset. The indiscriminate prolongation of life cannot be said to be without its disadvantages.

The preoperative and postoperative treatment has certain psychologic aspects. While the general practitioner, the psychologist and the neurologist come in intimate daily contact with patients, the surgeon often meets his patient at a great crisis.

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In undergoing a test of courage in submitting to the operation and in the reaction of recovery, the patient's mind is doubtless more plastic than at any other stage in his adult career. It is at such times that an opportunity is open to the surgeon of doing more than merely building up the physical structure.

A specialist who is content solely with repairing that particular line of pathologic disarrangement which happens to fall strictly within his specialty, often loses the advantages of a broad outlook on disease and on human conduct. To restore vision, to remove a crippling deformity, and to relieve pain are beautiful; but there should also be some interest in endeavoring to give courage and a better outlook on life. The most inspiring thing is not necessarily the formal printed or spoken word, but conduct. I have been helped more by observing patients who were suffering from diseases that they knew were hopeless and yet were cheerful and unselfish, than by any sermon or essay. It is often the privilege of the surgeon in his contact at the time of the patient's mental stress and strain before and after an operation so to influence him, possibly by little suggestions or by sympathetic interest, as to raise his ideals or in some way to make his outlook on life better than it was before. This may be just as important as the management of the physical welfare of a patient.

It is becoming more and more evident that the modern surgeon must not be satisfied with technical proficiency alone, highly important though it is. He must think in terms not only of anatomy and mechanics, but also of psychology, physiology and pathology. The general preparation of the patient for a major surgical operation involves inducing as calm a mental state as possible. It is much more difficult to take advice than to give it, and few individuals can approach a major operation without some qualms and anxieties. These apprehensions may often be allayed by frank talks if the patient is intelligent and wishes to discuss the situation. If the patient does not desire to hear about details of his disease or the treatment, he should not be filled with unwelcomed facts. Whatever is told, however, should be consistent with the truth. This not only creates at the time more confidence in the surgeon and his profession, but also gains more respect afterward from the patient and from the patient's family and friends.

The preliminary examination of the patient for any major surgical operation should always include a study of the heart, the lungs and the function of the kidneys. This is done by an internist unless the surgeon is one of those rare individuals who have kept up with internal medicine as well as with surgery. Usually, the surgeon can be more profitably occupied in making a careful surgical examina-

tion and in spending his additional time on the pathology of the tissues and in experimental work. One man cannot be truly proficient in every branch of medicine.

The old criticism of an operation being beautiful but the patient having died, has in it some cynical philosophy that we cannot afford to neglect. Surgery is safer now than it was a few decades ago, but this is due not so much to technical operative improvements as to a broader conception of the biologic features that concern the patient and an adaptation of them to the preliminary treatment and the after-treatment. An operation for exophthalmic goiter from a purely technical and anatomic standpoint is no better now than it was twenty-five years ago. In fact, the older operation with a wide dissection, demonstrating the deep vessels and nerves in the neck, was technically more beautiful than the modern operation. Now much of the posterior portion of the thyroid gland is left, there is no attempt to demonstrate the recurrent laryngeal nerves, and the operation is completed with reasonable speed and without undue trauma. After the operation of former years, however, without any particular preliminary or postoperative treatment, the mortality rate was from 35 to 40 per cent, whereas now, with what might be called a comparatively sloppy operation but with the proper preliminary and postoperative treatment, the mortality

has fallen to 2 or 3 per cent, and in some clinics it is even lower. Advances in thyroid surgery have come not by continuous improvement but, as is usual, by careful clinical observation combined with laboratory research, the abandonment of hypotheses proved to be fallacious, and finally by combining the many different factors that seem to increase the safety for the patient.

Observation of the deleterious effect of fright and excitement in exophthalmic goiter and attempts to abolish these emotions, as emphasized by Crile, were the first steps of improvement in the preoperative treatment of this disease. Then the making of as little raw surface as possible, the gentle handling of tissues, the absence of a profound anesthesia, an abundance of oxygen for the tissues, the administration of iodine both before and after the operation, the treatment of hyperpyrexia by ice bags, and the intravenous administration of dextrose as a buffer for the excessive metabolism, have all had a part in this improvement. The operative technic has become anatomically less admirable, but better preoperative treatment and postoperative treatment have been instituted, and the mortality rate has thereby been greatly lowered.

To a lesser extent something of this kind holds true in all operations. Twenty-five years ago it was the common custom in preoperative treatment to purge patients with large doses of castor oil, send-

ing them to the operating room dehydrated and exhausted. Physiologic reflection should have shown that this was incorrect. Patients need more water and more of the electrolytes during and following an operation than in normal health, so the administration of these substances instead of depleting the patient of them is indicated.

Rest in bed for at least one or two days before any major operation that is not an emergency is important. This not only accustoms the patient to bed, but tends to rest the heart, lungs and kidneys. Patients over fifty years of age may do better if they are digitalized before a major operation. The integrity of the heart is often difficult to estimate, but its function under exercise and the relation of function to pulse rate and blood pressure will usually give a reasonably accurate idea of its condition.

All therapy may be roughly classed under two "r's," rest and resistance. Hilton's classical work on *Rest and Pain* outlines principles that are just as true today as when they were written sixty-nine years ago. Rest includes not only the general rest of the body but also physiologic rest of special tissues or organs, which means the total or partial abolition of their function. Building up of resistance is accomplished in many direct or indirect ways. The removal of a gangrenous appendix may be cited as an indirect building up of resistance against bacteria by removing the source of infec-

tion and so abolishing the pathologic organisms it contained. In the same way a radical operation for cancer of the breast may be counted as increasing general resistance by removing an enemy of the tissues, for resistance after all is a relative thing and must be considered in regard to not only the quantity and quality of the resistance but also the quantity and quality of the enemy. Other methods of building up resistance of a more positive kind would be the administration of serums or vaccines, the regulation of diet, and the increase of blood by transfusion. Sometimes these two indications for rest and resistance conflict. Nourishment should often be temporarily dispensed with in order to secure rest for the gastrointestinal tract. It is unwise to give food to a stomach that has just been operated upon and has thus been for a while crippled in its function. If, however, the calories can be supplied in another way without causing activity of the stomach, as by continuous intravenous administration of dextrose in Ringer's solution, this method of nourishment may be advantageously adopted.

Formerly, patients with what we now term massive collapse of the lungs have perished because of the lack of a change of position, of a good spanking, or something that would deepen inspiration and facilitate pulmonary drainage. The recommendation of Yandell Henderson and his associates to give

oxygen and carbon dioxide after a prolonged anesthetic in order to prevent massive collapse by thoroughly ventilating the lungs is founded on the physiologic observation of the action of carbon dioxide as a respiratory stimulant, and is an excellent practice. The treatment of this complication by these measures is also indicated.

One of the essential elements to health is water. We can add to this calories and salt and make the combination still more effective. Transfusion of blood is often obviously helpful, but giving intravenously water and the salt elements of the serum, such as are found in Ringer's solution, sodium chloride, potassium chloride and calcium chloride, with dextrose, seems to be an ideal combination and frequently may be substituted for a transfusion. Matas has shown that the continuous intravenous administration of 5 per cent dextrose solution may sometimes be kept up for several days with great benefit. He originally employed it as a drop method like the so-called Murphy drip. We have modified this by using a small narrow burette graduated so that 100 c.c. of the solution fills 9.2 cm. of the length of the burette. In this way the rate of flow can be fairly accurately determined, and the danger of the entrance of air into the vein is obviated. Dextrose solution appears to stay in the vascular lumen longer than simple salt solution. In shock and low blood pressure it is run in rapidly, 500 c.c. or more

an hour, until the blood pressure comes up to a satisfactory level, when the rate of flow should be diminished. After each 500 c.c. a small amount of insulin, 12 to 15 units, about half the amount necessary for the dextrose, is administered, injecting it directly into the tube as the solution is flowing. We find this is better than giving a larger amount of insulin because the body tissues will take care of much of the dextrose. In cases of sepsis or lack of nutrition the administration should be slow, but continued over several days. Thus, after a partial gastrectomy it may be given intravenously for two days at the rate of about 100 c.c. an hour. It is a good remedy in the vomiting of acidosis. When there is a marked loss of fluid as from vomiting or from a fecal fistula, more of the solution can be given than under other conditions in which there is no abnormal loss of fluids. When there is no vomiting and the patient is thin and the blood pressure normal or elevated, it should be discontinued after twenty-four hours unless some special indication exists. After operations for hyperthyroidism this solution is excellent and acts as a buffer, the stimulated metabolism having the dextrose to burn instead of the tissues.

It must be recalled that dextrose is a normal constituent of the blood, there being about 0.1 to 0.2 per cent of dextrose in the blood serum. A stronger solution than 5 per cent is not necessary, unless

there is a degree of urgency for more dextrose as in marked acidosis. The dextrose should be pure, preferably that put up in ampules, else reactions may occur. The water is freshly distilled and tablets for Ringer's solution are added, then the ampule is opened and dextrose poured in. The cannula is removed from the vein in two or three days, and if it is necessary to give more of the solution after a discontinuance of it, another vein is used. Sometimes vomiting of clear or bile-tinged fluid occurs after a continuous administration for two days. This may be an early symptom of "water sickness" and cease when the intravenous administration is discontinued.

Another valuable suggestion of Matas for after-treatment in some operations upon the gastrointestinal tract is the use of a duodenal tube inserted through the nostril into the stomach and permitted to remain. In dilatation of the stomach or in toxic conditions when there is vomiting—an apparent effort at excretion by the gastric mucosa—the stomach can be drained and frequently washed out with a small amount of soda solution without inconvenience to the patient. Later, nutrition may be administered through the tube. In a case of duodenal fistula following an extensive gastrectomy in which there was infiltration about the pancreas and duodenum, I have had the fluid from the fistula injected

through a long Jutte tube that reached through the nose and stomach well into the jejunum.

It has been shown by Waltman Walters that the loss of pancreatic secretion is almost as quickly fatal in a dog as an upper intestinal obstruction would be. This is quite different from the loss of bile from the gall bladder. Bile can be drained externally almost with impunity for weeks or even for months, though not indefinitely; but the loss of all pancreatic juice is quickly fatal. In a duodenal fistula when there is great loss of pancreatic juice, an oblique jejunostomy with a tube after the technic of Coffey or of Witzel and injecting the duodenal fluids into the tube is an excellent practice employed by many surgeons. This can be continued until the patient recovers sufficiently for the fistulous tract to close.

The knowledge of the physiology of the stomach and intestines has been greatly extended by the work of Pavlov, Cannon, Carlson, Luckhardt, Alvarez, Klein and others, and points the way to the proper filling of many indications in the postoperative treatment of gastrointestinal cases.

The possibility of reducing the virulence of bacteria in the intestine by diet, such as the avoidance of proteins, the increase of carbohydrates and an abundance of water, is of great importance in surgery of the colon, not only as a preliminary preparation but also as postoperative treatment until

the tissues have well healed. In achlorhydria bacteria in the stomach and intestines develop freely. The administration of hydrochloric acid in such a condition simulates the normal antiseptic action of gastric juice and is a great aid in reducing the incidence of sepsis subsequent to gastric and intestinal surgery.

The point at which rest of a tissue should give way to action often is difficult to decide. The work of Harvey, of Yale, Carrel and others has thrown much light upon the healing of tissues and the strength of the wound and the sutures. There comes a time at which healing is sufficiently strong to resume activity. Ordinarily a muscle-splitting incision, where the fibers were not cut across, will permit of function earlier than a long incision with some of the fibers divided. But tissues are no stronger after an operation done by one surgeon than after a similar operation by another surgeon, and it would seem the part of wisdom to allow sufficient healing and strength before the strain on the abdominal muscles is gradually resumed. This can hardly be expected without at least ten or twelve days in bed. In the longer incisions a longer rest is necessary.

Deep breathing, sunlight, proper diet and rest when the patient is tired, are trite things but are necessary in all after-treatment, particularly after abdominal surgery.

Conclusion

Improvement in preoperative and postoperative treatment consists not so much in laying down hard and fast rules and empirical details as in applying broad biologic principles and, as Whistler said of his paints, mixing them with brains.

References

Henderson, Yandell, Haggard, H. W., and Coburn, R. C.: The Therapeutic Use of Carbon Dioxide After Anesthesia and Operation, J. A. M. A. **74**: 783, 1920.

Hilton, John: Lectures on Rest and Pain, London, 1920, G. Bell & Sons, Ltd.

Matas, R.: Continued Intravenous "Drip," With Remarks on the Value of Continued Gastric Drainage and Irrigation by Nasal Intubation with Gastro-Duodenal Tube (Jutte) in Surgical Practice, Ann. Surg. **79**: 643, 1924.

Walters, Waltman: Duodenal Fistula—The Effect of the Loss of Gastric, Duodenal, Pancreatic, and Biliary Secretions from the Body, Surg. Gyn. & Obst. **44**: 840, 1927.

Walters, Waltman, and Bollman, Jesse L.: The Toxemia of Duodenal Fistula: Physiologic Changes Concerned in the Production of Its Characteristic Chemical Reactions of the Blood, J. A. M. A. **89**: 1847, 1927.

CHAPTER XII

THE MEDICAL PROFESSION OF VIRGINIA*

A HISTORY of the medical profession of Virginia would be profoundly interesting. The presidential address of Dr. W. L. Harris at the Norfolk meeting of this society in 1926 on "John Peter Mettauer, A.M., M.D., L.L.D., A Country Surgeon," shows the attractive material that exists in Virginia for biographical essays on medical men. In a presidential address, which should be short, there is hardly time even briefly to sketch all of these interesting lives, so the temptation to speak of them must be resisted; for what now deeply concerns us are the problems of the present and of the immediate future.

Commercialism in Medicine

Times are changing. The intensely personal relationship which has existed between doctor and patient is waning. Many of the older conditions and customs are passing and new things are appearing. Whether we approve or not we cannot ignore this situation, and we must meet it as best we can. It is expected of us that we shall not fail in this trust: that we shall hold untarnished above all

*Presidential address before the fifty-eighth annual meeting of the Medical Society of Virginia, Petersburg, Virginia, October 18, 1927.
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changes the real purpose of the medical profession —that is, the conquest of suffering and disease and the saving and prolongation of human life. So long as this ideal is in the forefront and so long as doctors keep other things secondary or subsidiary, no real harm can come to the medical profession. But other things press closely. It is necessary for the doctor to have food to eat and clothing to wear, to educate his children and to maintain a certain standard of respectable living. The practice of medicine must pay at least a living wage, for the vast majority of medical men, whether specialists or general practitioners, are dependent upon their practice for the maintenance of themselves and their families. And are they not entitled to a living wage? The objects of their calling command the admiration and the respect of everyone, and it is certainly no more discreditable to be rewarded for curing a case of diphtheria or for saving a patient with gangrenous appendicitis than it is to be paid for winning a lawsuit over disputed property or for managing an industrial plant, and yet there is a very vital difference of responsibility when a human life is directly concerned.

While the physician should, of course, look after his business affairs in an orderly way, and while the laborer is worthy of his hire, when the commercial situation begins to dominate a doctor's life instead of being secondary, there sets in a waning

of the professional spirit and a tendency to convert the profession of medicine into a trade. There are many who feel that changes in the direction of commerce are not real progress—that the patronizing attitude of some pharmaceutical houses informing the physician as to the method of treatment he should adopt, and the condescending manner of some of the captains of industry are not to our credit.

Surely, medicine is a noble profession, but the constant dinging of this in our ears by well-meaning admirers, though pleasing to our vanity, is not helpful to our character-building. Doctors of medicine, like other aggregations of human beings, are subject to many frailties. It is a wholesome, even though sometimes a disagreeable, experience to take stock of ourselves occasionally and see if there are not within us faults that may be corrected or some unworthy attitude that may be altered.

The Fraternity of Medicine

The profession of medicine should be like a kind of religion, and each member should have a fraternal spirit. When the newspapers mention a doctor who has committed murder or is guilty of a high crime, every right-thinking medical man feels somewhat the disgrace. The misconduct of every member reflects directly or indirectly upon the whole medical profession. It particularly behooves us,

then, to examine ourselves wherein we may have sinned and to correct, if possible, our errors.

Since the World War the temptations for doctors have been peculiarly abundant. The pressure to break laws, to make short cuts to success, to take undue advantage of certain forms of publicity, has never been greater. If, then, a larger proportion of the younger doctors have fallen by the wayside than happened in the early careers of those of us who are older, it may not necessarily be due to a weakening of character but to more abundant temptation. When temptations come, however, it is all the more important to steel ourselves against them. We have no right to ask the Legislature or the public for consideration unless we really deserve it. The man who is dishonest and untrustworthy, even though he be a doctor, should not demand any respect because of his profession. As Dr. George C. Davis says: "We cannot expect an immoral man to become a moral physician. Medicine opens a wide field to the man without conscience. Is there a picture of more abject depravity than the physician given to the many forms of illicit practice, aiding and abetting crime, actually committing crime, preying on the afflicted in body and soul, capitalizing misfortune itself?"

The rules of honest conduct and of good citizenship are exceedingly simple. They are comprised in the Golden Rule, and in the magnificent verse

of Micah that the only requirements of the Lord are that we "do justly, love mercy and walk humbly." The difficulty is not in finding these rules, but in following them. The relation of the doctor to the patient requires no complicated ritual if he has the right spirit. It is the same as the traditional policy of the captain of a vessel or of the engineer or conductor of a railway train toward his passengers: the safety and welfare of the passengers are always supreme. The health of the patient should always be the chief consideration and duty of the medical man. When rules of ethics about matters of professional etiquette are stretched in any way to the detriment of the patient, it is a misinterpretation of the real spirit of medical ethics. Ethics in medicine merely means being a gentleman and following the proper dictates of right living and good citizenship.

The medical profession can be no better than its individual members. It is impossible for a doctor to besmirch his own private character without lowering the profession which he represents. The old tradition of the doctor being a leader for morals and good citizenship in his community cannot continue unless he literally practices what he preaches. There are many things that appear insignificant at first and yet tend to undermine character instead of strengthening it. Yielding to temptations that

beset the medical profession is one of the causes of degeneration of character.

Shall a Doctor Tell the Truth?

There are other things which the public associates with the medical profession that are not helpful in character-building. If we were to select the most important of the fundamental virtues, it would probably be truthfulness. Not only the academic love of truth, but also the practical application of it in daily life, is the mainspring of a desirable character. It is a public opinion that doctors and their associate nurses are not truthful to their patients. This seems to be viewed to some extent with casual amusement, but at the bottom is it not true that such amusement breeds disrespect? In a recent issue of *Harper's Magazine* a celebrated neurologist of New York, Dr. Joseph Collins, maintained the thesis that doctors should not always tell the truth to patients. Fortunately, he does not represent the real spirit of the medical profession. At the present time when efforts are being made to advance medical progress and to increase the confidence of the public in the medical profession, it seems peculiarly unfortunate that any article should appear from so eminent a source which will tend to weaken this confidence. The success of movements for the control of cancer, of measures for the prevention of heart disease and of other similar endeavors

must depend upon the intelligent cooperation of the public with the medical profession, and the basis of all this necessarily is the trust that the patient has in the doctor whom he consults. Advocacy of a policy of deliberate and intentional deception will do much to break down whatever confidence exists. To be sure, tact must always be used in dealing with patients, and it is not necessary to pour brutal truths into the unwilling ears of the sick. At the same time, when anything is told the patient, it should in all its essentials be true.

Dr. Richard C. Cabot, of Boston, has made a study of this question from a scientific standpoint and has written articles on the value of telling the truth to patients. He appears to have gone into the matter much more thoroughly than Dr. Collins did. Dr. Cabot seems to have shown from a clinical investigation that solely from a clinical standpoint this course gives better results than a deliberate policy of lying and deception. It is perfectly obvious that no one can respect a profession that must have some special lying license in order to carry on its work.

Moral Requirements for Medical Students

Among the many changes affecting the medical profession the rapidly rising standards of medical education are prominent. Forty years ago practically any one who could read and write and had

the price of the fees could study medicine. The standards have rapidly risen from this low level to a point where the minimum requirement is graduation from a high school and at least two years of college work. Many medical schools demand an academic degree for admission. All medical colleges now require a course of four years, and some an internship of a year in addition. This includes many of the best years of a young man's life, and there should be adequate compensation for the time and expense. But while the educational standards have advanced there has been practically no change in the requirement for moral character. The same casual certificate or letter from some acquaintance or preacher appears to be all that is necessary as to character. The consequence is that emphasis has been placed more upon the intellectual attainments and technical training than it has upon the character of the individual, and this notwithstanding the facilities for modern psychologic examinations and the opportunities for a thorough insight into the life, traits and family history of the prospective medical student. Does it not seem that this standard should have been raised at least in some degree proportionate to the standards for mental training? A candidate for the study of medicine should be fully examined to find his intentions in studying medicine, whether he is attracted to medicine as a profession or as a commercial undertaking, and

whether he has an ideal of real service. Some of the medical schools might thus be relieved of their undesirable students—undesirable on account of their ideals and their character, even though their mental equipment is all that could be desired.

The doctor who has a bad character possesses more potentialities for doing harm if he has had scientific training than if he has not had it. Consequently, a man of low ideals and lacking in scruples can be infinitely more dangerous in these modern days with the extensive scientific instruction necessary for medicine than he could have been when not so much was known.

It would seem wise to call attention of the authorities in medical education to this very important matter in selecting students from whom later the medical profession must be filled.

Public Health Work

The Department of Public Health in Virginia has increased enormously its good work. The medical profession of this state and throughout the country is losing a great opportunity for helpful service if it does not cordially cooperate in public health measures. The public itself demands that the state take every measure possible to prevent disease and to promote the health of the people. This object is in keeping with the best ideals and traditions of the medical profession, and by cooperating with the

public health authorities we can attain these ideals and uphold our standing with the public. Doubtless there are instances in which the enthusiasm or tactlessness of some of the agents of the health department have offended doctors. If such occurrences are reported to the head of the health department, I am sure they will be corrected or explained. If all of the local medical societies would appoint a committee to cooperate with the health authorities, much friction would be avoided and the local medical men could, through the direction of the authorities of the state health department, carry on preventive medical work such as administering toxin-antitoxin of diphtheria and similar measures, while at the same time maintaining their personal relationship to their patients and their prestige in public opinion.

"Allopathy"

The public often suffers because of a lack of appreciation of the efforts of the medical profession. The word "allopathy" which was wished upon us by Hahnemann is hard to down, and yet it is this very word that tends to create much confusion in the minds of laymen and even of some doctors. It is difficult for them to realize that regular organized medicine is not a *school* of medicine just as there is no "school" of astronomy nor "school" of anatomy—that a doctor who is bound by a creed

ceases to become a regular doctor and must practice according to his creed. A medical creed is in itself an ironbound thing that prevents progress. The regular medical doctor has a perfectly legitimate right to use any remedy that he thinks is best for his patient. Not infrequently methods employed by some of the cults are adopted in certain cases with much benefit to the patient. Naturally the members of the cults make the most of attempting to call regular doctors "allopaths," which really is a term of reproach; for it means that he who practices "allopathy" must give remedies causing symptoms unlike the disease he is treating, in contradistinction to the "homeopath" who according to his creed gives remedies causing symptoms similar to the disease.

Legal Regulation of Medical Practice

It seems strange that the legal regulations for the practice of veterinary medicine are really in some respects more stringent than those for the practice of medicine on human beings. Our State Health Department and our State Board of Medical Examiners have the highest standards and give faithful service, and yet in spite of their efforts not infrequently the Legislature nullifies the work of the State Board of Examiners. Of what service is a State Board to license men and women to practice medicine, when a special act of the Legislature gives

the right to practice to an arrant quack—a privilege that would not for a moment be accorded to him if he were to practice upon cattle? An unfortunate instance in our state is that of de Collard. Senate Bill No. 55, which passed the Legislature in the session of 1918 for Arthur de Collard, gave him the right to practice "poropathy" without any examination or inquiry into his scientific attainments by the State Board of Medical Examiners. This bill was earnestly opposed by representatives of the regular medical profession, but without effect. De Collard claimed to be a Corsican and a cousin of Napoleon. Undoubtedly he is foreign. He said that he graduated at several European universities but that all of his diplomas had been burned! He would not answer the simplest question on the elements of medicine and surgery, as he said the doctors were jealous of him. His attitude could be readily and justly estimated by any man of common sense, and yet a foreigner of this type was taken up and a special measure exempting him from the State Board of Medical Examiners passed the Legislature by an overwhelming majority. I understand that several "poropathists" who have taken the course under de Collard now desire to be licensed to practice medicine in Virginia.

Part of the bill, a mass of incomprehensible and senseless jargon, is as follows:

"1. Be it enacted by the General Assembly of Virginia: That the system and practice of Poropathy and Manipulative Surgery is hereby defined to be a new branch of therapeutics and is the use and employment of medical manipulation and absorption through the pores of the skin and the mucous membrane without medicine taken through the stomach or the use of the knife, and the use and employment of healing and curative agencies and lotions, applied directly to the diseased organs and to the nerves controlling these organs, through the pores of the skin and mucous membrane, which are opened by medical manipulation, and which immediately reach the disease or ailment through the eliminating organs of the human body, and by this process, heal and cure the following diseases and ailments: Neurasthenia or nervous prostration, internal cancers, stomach or otherwise, tumors, internal and otherwise, kidneys, liver, uterus, ovaries and all obscure ailments, adipose tissue, rheumatism, locomotor ataxia, cerebrospinal meningitis, St. Vitus dance, epilepsy, paralysis, tuberculosis of the joints, heart trouble, fatty degeneration, and valvular weakness; and also adjust, heal and cure broken bones, sprains, dislocations, displacements of muscles and joints, slipping of cartilages of knees or other joints, spinal injuries, breakages or displacements of small bones of legs and feet,

and supplementary system and science of Physical Culture, by which every muscle of the human body is reached, developed and strengthened without the aid of any apparatus; which treatment and Medical Manipulation consists of Poropathy, Manipulative Surgery, Massage, Physical Culture, Dieting, Herb-lotions and Salves, also including the treatment and cure of diseases or ailments through the pores of the skin and the mucous membrane of the human body as above mentioned and specified."

This bill giving de Collard full privilege to practice and teach "poropathy" passed in the Senate in 1918 by a vote of 17 to 7, and passed in the House of Delegates by an overwhelming majority. In the public hearing of the committee on this bill de Collard exhibited among other things a piece of decayed meat in a mason jar, and claimed that it was a cancer of the stomach, and that he had cured the patient by rubbing some material into the skin which caused him to vomit the cancer! The proponents for de Collard gravely and solemnly sat through such an exhibition. It is difficult to see how any intelligent man or woman could read this law giving special privileges to de Collard without having his risibilities aroused, except for the tragedy that such practice is permitted on our people of Virginia but would be utterly illegal for our chickens,

dogs or hogs. This law is even now in full effect on the statute books, and it is strange that it seems difficult or impossible to repeal such an utter monstrosity of a law—a disgrace to the statutes of Virginia and a menace to the health of the people.*

It is an obvious duty of every member of this society to instruct not only the representatives in Legislature from his or her county or city as to the viciousness of such laws as this and special laws to legalize cults of medicine, as chiropractic, but also to carry on the educational campaign among the intelligent public-spirited citizens of his or her acquaintance. All the good accomplished by the State Board of Health in its public health work and by the State Board of Medical Examiners in maintaining a high standard for the medical profession may be nullified by the passage of such laws as these.

Suggestions and Recommendations

Several states have adopted the plan of a post-graduate assembly for medical teaching. In Connecticut, for instance, under the auspices of the state society, each year there is an assembly to which well-known teachers and clinicians are invited to give lectures. The lectures may be illustrated by lantern slides, specimens or patients. The lecturers are paid their expenses. The doctors attend these meetings just as they would attend a post-

*Senate Bill No. 55, called the poropathy bill, was repealed at a subsequent meeting of the Legislature of Virginia (1928).

graduate school. This plan might be undertaken in Virginia, and those who are particularly interested could meet in such a postgraduate course under the instruction of some of the most eminent teachers and clinicians in America and at the same time be within easy reach of their homes and practices, and without the expense that such a course would cost if attended elsewhere. It has been suggested by Dr. Stewart Roberts, of Atlanta, a former president of the Southern Medical Association, that distinguished foreign medical men be invited to lecture at such an assembly.

It might also be well once in two or three years to have a general congress of medical and allied professions of Virginia. Such a suggestion has been made by Professor Wortley F. Rudd, dean of the Department of Pharmacy of the Medical College of Virginia. Druggists, nurses and doctors could very profitably have a day's session, probably in conjunction with the annual meeting of the Medical Society of Virginia, every second or third year, in which problems of common interest would be discussed.

After consulting the chairman of the Executive Council, Dr. Lawrence T. Price, and at the solicitation of several members of the Medical Society of Virginia who were interested in this matter, I have appointed a committee to survey and make recommendations upon the training of midwives. The

committee consists of Dr. Greer Baughman of Richmond, chairman, Dr. H. D. Howe of Hampton, Dr. J. Bolling Jones of Petersburg, Dr. William R. Martin of Charlotte Court House, Dr. H. G. Middlekauff of Weyers Cave, Dr. L. A. Calkins of the University of Virginia, and Dr. Mary E. Brydon of the State Board of Health.

Another committee has been appointed on the regulation of technicians. It consists of Dr. Charles Phillips of Richmond, chairman, Dr. W. E. Bray of the University of Virginia, Dr. R. E. Caldwell of Lynchburg, and Mr. Aubrey H. Straus of the State Board of Health as an associate member. There has been much confusion about the qualifications and the efficiency of technicians, a matter of very vital importance to doctors who are dependent upon laboratory technicians in chemistry, general laboratory work or in roentgenology.

Permit me in closing to express my profound appreciation of the honor that was conferred upon me in electing me president of the Medical Society of Virginia—a society that has great potentialities for good both for the medical profession and for the people of Virginia and whose interest I shall always deeply cherish.

CHAPTER XIII

THE MEDICAL PROFESSION OF VIRGINIA AND STATE MEDICINE*

ALL over the United States there comes the cry from the ranks of the regular medical profession of the tendency toward state medicine and of the infringement of state medicine upon the rights and privileges of the individual doctor. That this condition actually exists admits of no denial. The situation must be faced and some remedy for it devised.

First of all, we must realize that the ultimate object of the medical profession, whether expressed through the efforts of state medicine or through the practice of individual doctors, is to save human life and to relieve human suffering. This is not a mere academic statement; it is the practical principle upon which the existence of the medical profession depends and any legislation or rules and regulations that ignore this principle are based on false premises and should fail. There are, however, many honest differences of opinion as to the best method by which this object can be attained. It must be remembered, too, that such aims are extensive in scope. They include not only physical organic suffering, but also mental attitudes and the

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behaviorism of human beings. The practice of a certain amount of psychology, the correction of vicious mental habits, the stimulation for a better normal life, are just as much a part of regular medicine as the treatment of pneumonia or diphtheria or the removal of a ruptured appendix. Naturally, with such a wide range no one individual can cover all the different departments, so that medicine has come to be divided into numerous specialties. With some it is a question whether there are not too many specialties, but it is undoubtedly necessary that specialism must exist to some extent in order to attain the maximum benefit in many of these various lines of work. One of the most prominent, and one of the most alluring, specialties in recent years is public health work. It is not particularly remunerative for the individual who practices it, but the prospect of preventing sickness, of stamping out smallpox, diphtheria, typhoid fever and malaria, of preventing hundreds of cases of illness while the average practitioner would probably be curing only a very few, is enormously attractive.

In the nature of things there must, of course, be not only prevention but also cure. Sometimes it is difficult clearly to separate these two branches, though usually they admit of distinct lines of division. In order to attain the greatest good it is necessary that preventive medicine, with such agencies as the State Health Department, and the

general practitioner shall cooperate. This is not only necessary for idealistic purposes, but, practically, the people of Virginia have a right to demand the greatest relief from disease that can be afforded them, and if for any reason the medical profession of Virginia does not cooperate with the Health Department, the people will eventually force matters so that the Health Department must dominate completely.

The degree of enthusiasm and intelligence with which the individual doctor cooperates with public health movements stamps his citizenship. At the same time it is equally essential for the State Health Department to recognize the rights of the individual doctor and give him every opportunity to assist in the work of preventive medicine. If after these opportunities are granted he will not assist, the only thing the Health Department can do is to protect the people even if it becomes necessary to inflict some real hardship upon the individual practitioner.

That the State Health Department should as a general policy cooperate with the individual doctor is obvious. Every doctor is to some extent an unconscious health officer. Even though such remedies as diphtheria toxin-antitoxin can be administered by a nurse, there may be occasional instances in which even such simple remedies should not be given without a physical examination of the child.

Then, too, in the question of diagnosis the doctor is indispensable. His recognition of cases of diphtheria, of scarlet fever, of tuberculosis, of appendicitis and of cancer is entirely necessary before intelligent treatment can be applied. Until some universal serum is invented to cure all diseases, the family physician and the general practitioner are essential parts of any movement for the maintenance of the health of the people,

I have recently heard that Dr. E. G. Williams, the head of the State Health Department of Virginia which has done such splendid work, has in mind a campaign for the administration of the toxin-antitoxin of diphtheria that should practically eliminate diphtheria in the State of Virginia. This remedy is a type of vaccine along lines somewhat similar to that for the prevention of typhoid fever. One immunization comprising three injections produces immunity from diphtheria for an indefinite period of time in about 87 per cent of all patients. In the remaining 13 per cent subsequent immunizations may be required. This administration is simple and can be given by any one competent to give a hypodermic injection.

The universal administration of this remedy to children would stamp out diphtheria. The question is, how may it best be administered? Would it not be preferable to have the doctor in each county organize among themselves as a county medical so-

ciety and let each doctor be responsible for the families upon which he practices and see that these children are properly given this serum, and then report to the health officers, than to have outsiders take entire control? Cases that cannot be reached in this way may be immunized at general clinics throughout the county held under the supervision of the doctors of the county. Patients who are not able to pay should be given the treatment free. Those who are able to pay, and particularly when it seems necessary that an examination of the child be made, should of course pay whatever fee the attending physician thinks just. The medical profession of every county, however, should see that every child within the limits of that county has received this immunization.

If the medical profession will cooperate, I believe the State Health Department stands ready to help in every way it can. If each county, or several counties grouped together, will arrange a meeting of their doctors, the Health Department will send experts to give them a clinic, not only to talk, but to show how the diphtheria toxin-antitoxin or any other of the newer preventive remedies, such as smallpox vaccination without an abrasion, can be administered. I have the assurance of the officers of the Health Department that they will be delighted to do this. In this manner preventive measures can be carried out under the general supervision

of the Health Department, through the medical profession, and, first and foremost of all, the children and the people will be protected.

If the medical profession will cooperate in this way, the individual prestige of each doctor will be preserved, it will be a visible demonstration to the laity of the desire of the medical profession to live up to its professed ideals, and the opportunity for extending its influence and of increasing the power for good of its members will not be neglected. If, however, the medical profession will not do this, the public and the legislature will probably demand that measures for the prevention of diphtheria and other diseases be taken regardless of how it affects the doctors who do not seize this big opportunity that assistance in these matters will give.

May I earnestly suggest that the officers of every county medical society and of every district medical society, and, in counties where there are no organized medical societies that the individual physicians write to the State Health Officer assuring him of their willingness to cooperate in this matter and at the same time offering any suggestions or criticisms that they may care to make? Every death from diphtheria that occurs through unnecessary delay is a direct reproach upon the medical profession in Virginia. Let us, then, take advantage of this magnificent opportunity at the earliest possible moment.

CHAPTER XIV

POLITICS AND MEDICINE*

POLITICS and medicine have been commonly assumed to be two things that, like oil and water, would not or should not mix. In general this is true, but with higher ideals for the medical profession and for the health of the people, a satisfactory and effective emulsion may be made. Naturally, the chief obligation is upon the individual doctor to hold up the best traditions of medicine in deed and in truth, and to practice the spirit of medical ethics rather than take refuge behind technicalities. In these modern days of apparently lowered morals it behooves each member of the medical profession to become a leader in his community, not only for hygienic measures, but also for moral standards. A good citizen is a respecter of all laws. Unless a doctor leads the clean life he preaches, he resembles the rather contemptible politician who brazenly announces that he is politically dry but personally wet.

The contemptuous opinion concerning followers of Esculapius, held by many politicians and by some big business leaders, is naturally galling. If the follower is not true Esculapian but is one who desires "to seem" rather than "to be," who practices cults and who has no real human touch or scientific

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curiosity, he is not of the type that the regular medical profession would like to consider representative.

A distressing spectacle, enacted before every election, is that of candidates for governorship and other elective offices soliciting votes and attempting to secure favor from the different classes of voters by every available means. Because doctors seem timid in asserting the views they know to be right, their political influence has heretofore been regarded as practically negligible; but the medical men of the State of Virginia can, if they will, control any political office within the gift of the State. Such power, if exerted properly, would be the greatest asset to Virginia. The candidates begin months before the election to send out letters or propaganda. When the doctors are favored with such letters, much emphasis is laid on the relatives or parents who have been doctors and upon what great respect the candidate has for the medical profession, though the letter may be singularly neglectful of his record in matters of public health and the maintenance of scientific standards for applicants to practice medicine.

Can any member of the regular medical profession (which of course does not mean "allopaths," because there is "no such animal," this term having been wished on regular doctors by the founder of homeopathy) approved of any measure that endorses a pseudoscientific method, bounded by a

creed? Is there anything more absurd to a man who has real knowledge of anatomy and physiology than the tenets of the osteopath, the chiropractor, or the Christian "scientist"?

It does not seem to be generally known that the Veterinary Board of Virginia is much more careful in protecting horses, cattle and hogs from unscientific medical treatment than is the Legislature in protecting the health of the people of Virginia. The Veterinary Board requires that any one who undertakes to practice veterinary medicine or surgery in Virginia shall have a minimum requirement of two years in college and a thorough education in the fundamental sciences of anatomy, physiology, chemistry, embryology, pharmacology and pathology. There is no exception to this rule by which practitioners of cults, such as chiropractors, osteopaths or Christian "scientists," may treat horses, cattle or sheep—but they are permitted by the Legislature to practice on human beings!

Let each doctor inform himself about the record and the present platform of every candidate for whom he expects to vote. It is of no concern whether the gentleman or the lady in question has near relatives who are doctors or whether members of their family have been saved by the administrations of a regular medical doctor. It is also of no importance whether a candidate has voted for ap-

propriations for the State Board of Health or for the Crippled Children's Hospital, which appeal to the sentiment of the public and are, of course, commendable. The vital thing is whether the candidate is willing, because of a lobby maintained by the chiropractors, osteopaths, Christian "scientists" and others, to support a bill that will impair the power of the State Medical Examining Board and so enable the governmental authorities to place in charge of the little patients in the Crippled Children's Hospital the followers of the above-mentioned cults, who do not have the scientific education to permit them legally to practice on dogs.

Let each doctor ask the candidate for legislature or for governor whether he supported the miserable bill passed in the Legislature about five years ago, which not only enabled de Collard utterly to defy the requirements of the State Medical Examining Board as to his fundamental qualifications, but also permitted him to found a school from which others of his kind would be brought forth. Ask the candidate if he would have a man of this kind treat a blooded bull of his, and then follow up the question with the query whether he thinks permitting such men to have a license to practice medicine without an official inquiry into their scientific qualifications does not work a far greater injury to the health and well-being of the people of the State of Virginia than his vote for appropriations for the Crip-

pled Children's Hospital and for the Board of Health can possibly benefit.

Let us bring these matters out squarely and see where the people stand. It is a great opportunity for the members of the medical profession, as well as their privilege, to educate the people of Virginia along lines of sanitation and health. Many doctors would doubtless be much more prosperous and have more patients if there were no restrictions whatever on medical practice, because no regulation of medical practice means many cases of unnecessary sickness and injury. But that is not the point. We are not standing for the protection of the medical profession primarily, but for the protection of the health of the people of Virginia, which can only be done by upholding high standards of scientific medical education. A politician of sufficient education to appreciate the value of modern science cannot in good faith vote for the exploitation of the men and women in Virginia by the followers of cults. Let each doctor be in himself a public health educational bureau, and, discarding to some extent the ancient reserve, talk frankly to his patients about their troubles, describe briefly the anatomy, physiology and pathology concerned in the patient's complaints, and so give a basis of facts which will make impossible the sprouting of the seeds of error that the cults are busy in disseminating. Can any one with the correct conception of anatomy of the spine,

for instance, regard as other than absurd the claims of the chiropractor, or can an intelligent layman with even a smattering of knowledge of anatomy of the nerves of sensation perceive the slightest foundation for the doctrine of Christian "science"? Can any one with a knowledge of physics and chemistry seriously consider the theories of Abrams and his followers? When the Legislature and those in authority are willing to exempt men like de Collard from the requirements of the State Medical Board, they may go farther and, if they believe his merits are sufficient to demand special legislation for exemption, insist upon such men being placed in charge of the Crippled Children's Hospital or of other institutions where little children are treated for congenital and acquired deformities.

The fate of the health of the people of Virginia lies in the hands of the members of the regular medical profession. Every physician should explain to his patients matters concerning anatomy, physiology, pathology and therapeutics; and he should make a personal inquiry of the candidates soliciting his vote as to their past record and present views and attitude toward regular medicine.

The recent experience in Connecticut cannot be too strongly emphasized. The Legislature, against the earnest protest of the regular medical profession, created many different Boards by which numerous cults and many grades of medical practi-

tioners were admitted to practice medicine. It was soon found, even by laymen, that the mortality for insignificant diseases and injuries was great. Then the people took the matter in their own hands and instituted a grand jury investigation, but not until there had been numerous deaths which seemed unnecessary. The *New York Times* commented upon this as follows:

"Connecticut's highly commendable campaign against quack doctors, and its reverberations in other states, almost warrant the hope that success might attend an immediate and earnest attempt to change the medical practice laws all through the country. And no laws need changing more. Thanks to the abysmal ignorance in medical matters which characterizes a majority in our legislative bodies, statute books show how well the quacks have been able to win confidence in the two delusions on the acceptance of which their legal right to do business must rest. The first of these is that nothing is 'medical practice' except the administration of drugs, and the second is that there are and must be 'schools' of medicine, each equally efficient and each entitled to bestow upon its representatives the title of doctor. * * *"

"In no State should there be more than one medical examining board, and that one alone should issue licenses to practice medicine. Its members would not belong to any 'school.' They would be

men of real medical education themselves, able to distinguish between a real medical college and a diploma mill—between a real doctor and a quack. * * *"

"Not one of the men licensed by such a board would claim universal efficacy for any form of treatment. Whoever does that is instantly revealed as a quack, either ignorant or dishonest, and he is not any the less a quack because he can produce 'testimonials' from grateful patients, including the familiar legislator whose close relative was saved from the fast-approaching death by an 'irregular' after he, or more often she, had been given up by anywhere from one to a dozen 'regular' doctors."

"The number of people, otherwise intelligent, who thus can be deceived and with the best of intentions can deceive others as gullible as themselves is disgracefully and humiliatingly large."

CHAPTER XV

THE VIRGINIA ACADEMY OF SCIENCE—OUR FIFTH ESTATE*

THE lords temporal, the lords spiritual and the people have long been recognized in England as the "Three Estates." An editorial in the *New York Times* of August 22, 1926, refers to the act of Edmund Burke in calling the public press the "Fourth Estate" as he pointed to the reporters' gallery and remarked that it was far more important than the other three estates. The editorial continues:

"But since the days of Burke there has risen a group of men and women scattered among all the civilized nations who have deserved, as one of their number, Dr. Arthur D. Little, said at the centenary celebration of the founding of the Franklin Institute, to be ranked as the Fifth Estate—the world's men and women of science. Their meetings in the last year, and especially the last few weeks, in several world centres of culture, have, with the assistance of the Fourth Estate, brought their service to a wider notice than it has had heretofore.

"Numerically this Fifth Estate has always been 'feeble and insignificant,' but not more so than the Fourth Estate was when Burke made his gesture toward the reporters' gallery—not more in number

*Presidential Address before the Virginia Academy of Science, May 6, 1927.

than 100,000 persons in all the world, it is estimated. Its political influence is nil and yet it has 'recast civilization' through its study and application of the fundamental facts and laws of Nature. When its members sit in Congress, as they do rarely, 'they sit in the gallery,' not even as members of the Fourth Estate with some interpretative function but as mere onlookers. And yet this Estate possesses qualities of incalculable advantage to the public if only utilized. * * *

"This Fifth Estate * * * is in the way to helping man to get a clearer view of what his destiny should be now that he has come nearer to controlling his own destiny. And its obligation and privilege as most aspiringly and inspiringly defined by its protagonist are to bring home to every man the wonders, the significance and the underlying harmony of the world in which we live to the end that all undertakings may be better ordered, all lives enriched, all spirits fortified."

When in May, 1923, a small band of scientific workers assembled at Williamsburg to organize the Virginia Academy of Science, even they probably did not fully realize the great potentialities of this Society for service to the people of Virginia and to humanity. The value of scientific work and of research in pure science is becoming increasingly important, and no scientific association has any excuse for existence unless it be some stimulant to

research. It would appear to be belaboring the obvious to attempt to discuss before a body of scientists the benefits and the advantages of research. Unfortunately, however, these things are not fully appreciated by the people of the State, and one of the greatest opportunities Virginia has—that of developing the best intellects among its citizens for the State itself—is sometimes lost because of lack of encouragement to workers in research. The statement has been made that there are more exnatives of Virginia in "Who's Who in America" than exnatives of any other State, in proportion to population. This means a loss of the most important asset of the State and occurs not so much from lack of fields of endeavor, for Virginia is physically bountifully endowed with mineral deposits, with rich soil for agriculture, with fisheries, and with potentialities for factories and hydroelectric plants. Progress in developing these things, however, depends directly or indirectly upon scientific research as much as it does upon the expenditure of capital. When our people begin to realize these things more fully, the scientific worker will receive better support and instead of an exodus from our State of many of our best minds, there may be inducements for others to come here. Doubtless this desirable state of affairs is far in the future, but it need not be if sufficient encouragement is given to scientific research in Virginia.

The recent beginning at Hopewell of a $125,000,000 plant, in which the nitrogen of the air will be combined with hydrogen from water to form ammonia, is a striking example of the commercial advantages of research. There is no important factory in Virginia that could operate efficiently without the aid of its chemists or its engineers. That the health of the people is largely dependent upon biologic and chemical research is obvious. The numerous biochemical products, such as serums for the cure of diphtheria and scarlet fever, and the recent toxin-antitoxin by which diphtheria may be eliminated forever, are striking illustrations of this. New drugs and physiotherapy, including the scientific uses of radiation and diathermy, have brought great relief from suffering. Researches in bacteriology and studies in pathology usually have a clinical bearing.

No one can tell when a discovery in pure science will begin to have utilitarian effects, and if it be insisted that all research must have this in view, it will be strangled at birth. The study of the development of the embryo, for instance, often gives light upon the pathology of defects and of various types of tumors. Research in the structure of the atom may make the alchemist's dream of the transmutation of elements come true, or it may result in the utilization of some sources of energy now unknown. The discovery of helium about thirty years ago was the result of the observation of a band

in the spectroscope of the corona of the sun in eclipse, which had no spectroscopic counterpart in the substances of the earth then known. Stimulated by this observation, Ramsey finally discovered helium which produced this spectroscopic band. Helium, a noninflammable light gas, is proving valuable in the inflation of balloons and dirigibles.

So practical a man as Hoover,[1] then Secretary of Commerce, said in an address before The American Association for the Advancement of Science at a meeting in Philadelphia: "A host of men, great equipment, long patient scientific experiment to build up the structure of knowledge, not stone by stone but grain by grain, is now our only sure road of discovery and invention. We do have the genius in science; he is the most precious of all our citizens. We cannot invent him; we can, however, give him a chance to serve. And the more one observes the more clearly does he see that it is in the soil of pure science that are found the origins of all our modern industry and commerce. In fact our civilization and our large populations are wholly builded upon our scientific discoveries."

From the same cabinet, Jardine,[2] the Secretary of Agriculture, says: "It is no exaggeration to say that through the research accomplishments of recent years the average farmer today knows more of the science on which his industry rests and brings it into constant application than the scientist knew

fifty years ago. Yet there remains much to be done. The agricultural field is full of problems, a large proportion of which depend for their solution on the effectiveness with which underlying problems in pure science are dealt. American science, I am convinced, needs to concern itself more with fundamental research than it has done heretofore. No country in the world has made such progress in applied science, but our record in pure science is not so flattering. * * * This is the situation despite the fact that we have vastly more students in colleges and universities in proportion to the population than has any other country in the world. The difficulty seems to me twofold: We are not laying enough emphasis on pure science in proportion to our emphasis on the applications of science; and we are not stimulating and training an adequate personnel in scientific research."

These quotations are from men with scientific training, but who are also practical though long-visioned business men. With such an unqualified endorsement of the need of research in pure science, and when encouragement of the pure science worker comes from such sources, it behooves the people of Virginia to note this advice and admonition, else we cannot hope for real progress.

Dr. Charles H. Herty, a Southerner by birth and raising, in an address at the dedication of the new chemistry building at the University of Richmond,

April 11, 1927, observed that the thirteen Southern States, and Virginia particularly, were woefully deficient in their contribution to original chemical research as compared with the rest of the United States.

That America, however, has not been without research workers of the first importance in pure science has been demonstrated, even though their products are not so numerous as those of Europe. The epoch-making discoveries of Matthew Fontaine Maury, a Virginian, gave accurate and orderly knowledge of the currents of the ocean—a research that proved a boon to navigation. The work of Joseph Henry, a former professor of physics and natural history at Princeton, is comparatively unknown except among scientific men, and yet he discovered the principle of the electric telegraph and anticipated Faraday by a year in his findings that a magnet produces electricity, although he did not publish this in sufficient time to get credit for his work. Alexander Graham Bell said that the successful conclusion of his own research on the telephone was due to the encouragement and advice given him by Henry. It is such men as Maury in physical geography and Henry in physics who by the discovery of great principles and of new facts lay the foundation for a more spectacular adaptation of these things to commercial uses. Though the application of these discoveries may catch the

public eye, it is the patient worker who uncovers these principles to whom the chief glory should go.

Besides all this, even disregarding the great significance and value of the discovery of a new principle or a new method, we must consider the highly beneficial effect of the intellectual training on one who does real research. The so-called research undertaken by the incompetent or the untrained with sloppy and inaccurate methods, is probably not intellectually helpful. Of such are the illogical schemes for perpetual motion or the usual announcement of cancer "cures" in the Sunday newspapers. If, however, a person with intellect and training has a problem and considers it in a serious way, no matter how humble the problem, it should be considered and the work encouraged. If the Virginia Academy of Science will function in this way there is no greater service it can render the people of Virginia.

One of the greatest advantages of research, and one that is often overlooked, is the effect training in research produces on the intellect and on the character. In an address before Section N of the American Association for the Advancement of Science, Professor A. J. Carlson,[3] of the University of Chicago, has well elaborated this theory. He thinks that in every college some research work should be assigned the student—not with the idea of making him a profound research worker, but to give an

insight into scientific methods and to develop his intellect so he can without restrictions or shackles seek for truth. That such work should benefit not only the intellect but also the character of the individual seems obvious. That it does not always do this is equally certain, but according to Carlson some men have water-tight compartments in their brains permitting them to think logically upon some subjects but to throw this method to the wind when other things are concerned.

Last year following the report of your Committee on Research the Virginia Academy of Science adopted its recommendation and the retiring president, Professor R. E. Loving, of the University of Richmond, and I, acting upon the instructions of the Virginia Academy of Science, appointed a Committee on Research consisting of: Robert E. Loving, professor of physics, University of Richmond; C. P. Oliver, associate professor of astronomy, University of Virginia; Donald W. Davis, professor of biology, College of William and Mary; L. R. Geissler, professor of psychology, Randolph-Macon Woman's College; Robert F. McCrackan, professor of chemistry, Medical College of Virginia.

This Committee has been organized and has adopted rules for its procedure. Its function is to encourage research in Virginia in every way it can. There will be offered at this meeting a prize of fifty dollars in gold for some particularly meritorious

paper read at this session of the Academy and based upon research. Among its other duties this Committee has general supervision of the awarding of this prize.

With the consent and support of the Council of the Academy of Science I have undertaken to raise an endowment fund for the Academy. It is hoped that this endowment will soon reach at least $25,000. At present $8,275.00 have been subscribed. It was stipulated in securing the subscriptions to this fund that it is to be used as a trust fund, the principle not to be expended, but that the annual income will be divided into three parts—not necessarily equal parts: (1) For a reward for a particularly meritorious paper based upon research read at the annual meeting of the Virginia Academy of Science; (2) a portion of the income is to go to the Committee on Research to pay its expenses; and (3), a portion is to be used as a grant to help research work that in the judgment of this Committee on Research is worthy and needs financial assistance. In this way there will be a perpetual fund, small though it be at first, at the command of the Committee on Research, and it is hoped that this fund will be enlarged until the annual income will be sufficient to increase the amount allotted to these three objects and probably to distribute some of it along other lines that may in the future suggest themselves.

As the Academy of Science is not endowed, most of these subscriptions were taken with the promise that they would be paid in four semi-annual installments beginning October, 1927. In this way the interest on some of this amount will begin from the date of the first payment. A small amount has been paid in cash and this has been turned over to the First and Merchants National Bank to be kept in trust until the other subscriptions are due.

In order that the Academy may receive subscriptions for its endowment fund and manage this fund legally and without embarrassment, the Virginia Academy of Science should be incorporated. I recommend that a resolution authorizing incorporation be passed at this session, giving the power to the Council, with the addition of the president and secretary, to attend to the immediate incorporation of the Academy.

In raising this endowment fund Richmond men have aided enthusiastically. I particularly wish to acknowledge the helpfulness of Mr. John Stewart Bryan and of Mr. John M. Miller, Jr., both of whom not only made large personal contributions but were fully sympathetic with the objects of this endowment and gave freely of their time and thought.

While the total amount is not large it should give a net income of about $400 a year, and this divided

in the manner suggested will be stimulating and helpful.

Governor Byrd, of Virginia, has given encouragement to the idea that our Committee on Research may act somewhat as an unofficial privy council to the administration of the State, so that subjects pertaining to the sciences as biology, chemistry, geology in connection with agriculture or the industries can be referred to this Committee for an opinion in order that proper legislation and regulations may be adopted. In such a way the State of California has been greatly benefited, and a service of this kind coming as it will without any additional expense to the State unless special work has to be done, will give the State the advice of scientific men upon problems with which they are most competent to deal.

We must look forward to the growth of the Academy of Science, not only by an increase in members and in the attendance upon the Sections, but by an increase in the number of Sections. Arbitrary establishment of a Section without an adequate demand would be unfortunate. The four Sections at present are a Section of Astronomy, Mathematics and Physics, a Section of Biology, a Section of Physiology and Education, and the Virginia Section of the American Chemical Society. It would seem wise to establish a fifth Section and

call it a Section on Miscellaneous Topics. Here could be assigned each year any group which wishes to discuss a branch of science not included in the existing Sections. For instance, it has been suggested that the establishment of a Section on Geology might be advisable. In order to see whether this Section would be worth while, an experiment could be made of trying out for two years a group of men interested in geology and having their papers read in the Section on Miscellaneous Topics. If the interest wanes and the attendance does not justify a new Section, no harm would be done and the subject could be dropped. If, however, interest in the subject continued, a Section on Geology could be established and the Section on Miscellaneous Topics would remain in order to try out some other scientific group. As the attendance and the work increases, some of the loosely allied sciences that are now grouped in one Section may be temporarily separated and tried out in the Section on Miscellaneous Topics to demonstrate whether it would be worth while to establish a new section. The establishment of a new Section means increased work and involves a certain amount of responsibility, and should not be undertaken lightly.

Finally, may I express my confident faith in the future success of the Virginia Academy of Science

and in the abundant service that it will render not only to science and to Virginia, but also to all mankind.

References

1. Hoover, Herbert: The Nation and Science, Science 65: 26, 1927.
2. Jardine, W. M.: Agriculture and Modern Science, Science 65: 333, 1927.
3. Carlson, A. J.: Research as a Method of Education, Science 65: 125, 1927.

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